A Case Study of Curricula Design and Teaching Strategies for Educating Tomorrow's New Media Artists

Manuelle Freire

A Thesis

In

The Department

of

Art Education

Presented in Partial Fulfillment of the Requirements
for the Degree of Master of Arts (Art Education) at
Concordia University
Montreal, Quebec, Canada

September 2009

Your file Votre référence
ISBN: 978-0-494-63076-1
Our file Notre référence
ISBN: 978-0-494-63076-1

ABSTRACT

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This study investigates the curricula of three studio-based courses in an undergraduate Computation Arts program, and examines how the instructors implement the curricula. I analyzed the courses' structure and content, I interviewed the instructors and conducted an in-class observation in one of the courses. Central to this examination are the pedagogical objectives and teaching strategies adopted to articulate the three headings of new media art education: the technical expertise in multiple tools, the critical and analytical discourse and the rapidly evolving technology and new media theory. I found that although the teachers are building on traditional models of art education, they also incorporate into their pedagogical practices the processes of media production and consumption that are defining the contemporary new media art paradigm. The findings were juxtaposed to the ideas of educators who write about the development and adoption of new directions for training artists in the necessary skills to engage effectively with the future technological and cultural change.

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CHAPTER 1

INTRODUCTION

Reasons underlying the choice of the research topic

The well-known sound characteristic of a Macintosh computer startup usually marks the beginning of my day. For a few years now, regardless of the type of work I need to complete and even of the geographic location I work from, this sound tells me I am at work. I automatically type my password and I'm logged in. The applications bounce from the dock, the modem lights flicker, new e-mail alerts appear and software updates are suggested. Then the daily news headlines appear, documents open and windows overlap. "F12" offers a quick look at post-its, date and time, birthday alerts and the weather forecast. With a cup of coffee, this is my daily startup.

Most of the time I need an Internet connection because my work processes require that I constantly upload and download media, to and from various sources: images, videos, sound, fonts, applications and plug-ins. I need to access websites to communicate with partners, colleagues and clients and often for troubleshooting assistance. There is always a friend online to help me, or a stranger who has shared his solution to my problem in a blog.

However, at times I must step away from the machine. My training in Graphic Design (the field in which I now work) took place in a traditional Fine Arts school and started with a strong focus on drawing (up to eight hours a week for three years), aesthetic theory and art history. The program on digital media had the same basic foundation courses as painters and sculptors. During my studies, although my research

increasingly relied on online sources, my concept development and thinking processes were always better developed "offline" through collage, drawings, diagrams, research notes and schematic thinking. I still use these processes in my art and design work today, but I most often compose the work on the computer. I usually begin with the transfer of digital media between peripheral devices (scanned images, digital photographs, captured video or sounds). The work invariably changes from the initial idea as I digitally manipulate it and as bits and pieces "travel" between applications. My favorite final output remains the print medium. Lately only my personal work is printed as there seems to be less demand for this format for commercial purposes.

When I enrolled in the Art Education MA program at Concordia University I had little prior knowledge of pedagogical practices and theories about new media arts teaching and learning. In the course of my studies I started reflecting on my experience as a student and my work as an artist. I investigated art education theory concerning the training of young artists who, like me, use a computer as the center of their tool set, and are eager to explore the creative potential of new technologies. Having only experienced this field from the perspective of an artist and a student, this research allowed me to go beyond theory and take a first hand look at the issues underlying the development and implementation of new media art education curricula from the perspective of the educators. I defined two main questions that I answer through this research:

- WHAT are the conceptual frameworks, pedagogic objectives and teaching challenges of courses that explore contemporary approaches to creative technological practices?

- HOW are instructors developing teaching strategies that incorporate the study of technology, artistic inquiry and critical thinking within today's context of rapidly evolving technology and theory?

Reasons underlying the choice of the case studied

In order to understand how art educators are addressing the research questions, I looked into the undergraduate programs offered in the Design and Computation Arts department, a few floors above the Art Education department. I was familiar with the work of some of the teachers from that department and I had often spent time there to see the students' work exposed in the vitrines. I consulted the departments' program and course descriptions to find out if they could somehow inform my inquiry. When I discussed my intentions with one of the teachers in that department, she pointed out the B.F.A. Specialization in Computation Arts program. The general description of this program in the home page of the department's website states:

> The Computation Arts program provides students with a rich foundation in creative work at the intersection of design, art and technology. The program guides students in **developing digital media work that is aesthetically engaging, conceptually provocative and technically innovative.** Our approach to teaching emphasizes an awareness of the cultural and political implications of a society that is increasingly wired and networked together.[1]

[1] http://computationarts.concordia.ca/, retrieved 2/12/2008

The Specialization in Computation Arts is a 60-credit program. Students must take the required six-credit course in Fine Arts which explores visual and performance arts in Canada. In this program students experiment with different media. However, the program is designed to allow students to concentrate on a specific medium, if they discover in the course of their studies that it best suits their artistic practice.

For this research, I selected three of this program's studio-based courses, that touch on different themes and media. One is an introduction to image, sound and interactive media, which explores the convergence of media within the contemporary models of new media production. The second one explores languages of computer programming to create visual and interactive applications. The third course is geared towards researching different fields of study as sources of topics and concepts to critically investigate through creative studio work.

The three courses are required courses for the completion of the program. They are all new media and multimedia oriented but do not focus exclusively on the technical skills to operate the technologies. Instructors also explore concepts and theoretical considerations. Although the subject of my research was defined early on, it was only after I chose the courses and took a closer look at their structure and content that I finally focused the research questions in a way that would allow me to take full advantage of what this investigation could teach me.

It was challenging to approach the instructors and explain my intentions to conduct a case study of three learning environments of which I had never been part. Although I am familiar with similar programs and with the work being developed and media being used in these courses, I was never a student in this department and this was my first contact

with the participants. I provided an abstract of the research project with my e-mail invitation to participate to the instructors of each course, and within a few weeks I was collecting data.

When analyzing the data that emerged from this case study, I make links to contemporary literature on new media art teaching. Thus, the study that follows will allow me to build a solid understanding of what is being discussed and developed today, and hopefully what is foreseen for the near future in the teaching of new media artistic practices. I hope this study will be a source of valuable findings and insights for myself and other practitioners who are looking to define their teaching philosophy and strategies.

CHAPTER 2

REVIEW OF LITERATURE

The proliferation of writings about the central concepts of this thesis – new media art, technology and art education – have made the review of literature for this study an ongoing exercise of selection and critical thinking. I came across very different ways of thinking about these concepts. Hence, in the very early stages of the research process I was confronted with the challenge to define and stay within the boundaries of my research topic. The idea of the rhizome is a very adequate metaphor to map my definition of these boundaries; originally this idea represents a structure of reasoning that grows through a web of interconnected links (Deleuze & Guattari, 1987). Our digitally mediated reality has often been compared to such a structure because of the kind of interactions occurring through hyperlinks and the pattern of online participatory social networks that we live and learn through. As I mention in the Introduction, I certainly live immersed in this vast collective structure of interconnected sources of information, and like many other digital artists, these interactions are an intrinsic part of my own learning processes and of my work. So, to respond to the rhyzomic nature of the collected sources of theory that touch on my research topics, I have confined my focus to a limited set of possible connections by concentrating on the links between very specific concepts and ideas. This resulted in three bodies of literature that inform this study.

The first group of authors contributed to the definition of three key concepts that need to be defined as a crucial starting point in order to steadily move forward in this research. From the moment I chose the particular focus of my study I determined that

under the wide umbrella of the New Media my project would be more narrowly concerned with the concepts of Digital Art and Computation. In the first section I review texts that have helped me define each one of these three concepts.

The second body of literature is *Theory that showed the way*. This section includes authors that discuss issues of teaching at the intersection of art, technology and culture. The authors presented in this section were particularly influential in the articulation of my two primary research questions and provided me with much useful frameworks within which I analyzed the three courses of this case study.

The third body of literature, *Theory that ensued* regroups authors that I referred to throughout the research process when looking to confirm and articulate ideas that I intuitively considered relevant to answering my research questions.

1) *Definition of key concepts*

To ensure a consistent use of the terminology throughout this study, I define the three fundamental concepts of New Media, Digital Art and Computation. These definitions place Computation Arts within the scope of Digital art (Murray, 2003) and this concept, in turn, within the broader concept of New Media (Paul, 2008). I chose these authors because they provide a broad understanding of the history and present social connotations of each concept. It is important to mention that it is unlikely that these definitions stay without change for a long time, given the pace of change in the field and the multiple perspectives from which they can be analyzed.

Lev Manovich introduces *The New Media Reader* (Wardrip-Fruin & Monfort, 2003) with a text entitled *New Media from Borges to HTML* where he presents eight propositions for *What is New Media?*. I adopt three of the eight propositions to define this concept. In the first of Manovich's propositions, the term New Media is concerned with the "new cultural objects enabled by network communication technologies" (p.16). Examples of such cultural objects are the Internet, web sites, computer multimedia, computer games, computer generated special effects and virtual-reality. Additional forms are constantly being added, such as the more recent digital television and e-books. Most of these objects result from previously existent analog cultural forms turned into digital data controlled by software. Therefore they often still obey conventions of representation, narrative and aesthetics. However, it would be wrong to limit my understanding of New Media to an algorithmic execution of actions previously executed manually or through other technologies. This takes me to the second proposition I adopt: "A substantial change in quantity leads to the emergence of a qualitative set of phenomena" (p.21). The digital manipulation of data that used to be analog also enables previously non-existent representation forms, as is the case of computer-generated movies that explore perspectives or frame rate that could not be achieved before. It also enables real-time network communications and real time distance control of technological devices, contemporary common practices that constitute the very foundation of our information society and make possible various forms of cultural objects and new media art. The third proposition is related to the previous one, as it is another example of quantity changing into quality throughout media history: the gradual accumulation of media records and the automation of media access, management and manipulation techniques is redefining post-

modern aesthetics. Manovich writes:

> The New Avant-Garde is no longer concerned with seeing or representing the world in new ways but rather with accessing and using in new ways previously accumulated media. In this respect new media is post-media, or meta-media, as it uses old media as its primary material. (p.22)

As I will demonstrate ahead, this study has allowed me first-hand observation of how this qualitative change reflects in the "cultural objects", how we are learning and teaching to produce such objects and to creatively experiment with constantly evolving technological media within this post-modern paradigm.

Christiane Paul offers a comprehensive text on Digital Art in her book with the same title (Paul, 2008). She places Digital Arts within New Media Arts where the term *new* points to the continually emerging "new possibilities for the creation and experience of art" (p.7) Nevertheless, the new media arts, and thus the digital arts do not define a completely new paradigm. Like Manovich on New Media, Paul affirms that the history of digital art is bound to the history of technology and art. The first chapter of her book provides a short history of the digital medium and art since the 1960s, and places emphasis on the fast developments that took place in the 1990s – the decade when computer hardware and software became more widely available. The 90s were also the boom years of the World Wide Web and finally, the years when the digital arts entered the mainstream art world of institutions, museums and galleries.

Key to her understanding of the various manifestations of digital art is the distinction between "art that used digital technologies as a *tool* for the creation of traditional objects – like photography, print, sculpture and music – and art that employs these technologies

as its very medium, being produced, stored, and presented exclusively in the digital format and making use of its interactive and participatory features."(p.8) This classification is not meant to create a rigid boundary between two categories, since many art forms today use technology both as tool and a medium. Rather it is a helpful "preliminary diagram" that Paul uses to characterize different forms of art that use the digital medium. Throughout this thesis that deals primarily with the computation medium, I often refer to the computer and its peripheral devices as tools or as media. When I do so I adopt Paul's distinction.

In her introduction to *The New Media Reader* entitled *Inventing The Medium*, Janet H. Murray (2008) elaborates on four defining properties of the computer, which are key to my study. According to Murray, the computer is encyclopedic, spatial, procedural and participatory. It is encyclopedic as it is clearly the medium capable of holding the most information invented to date. It is spatial in that it can embody dimensionality, presenting itself as a space one can enter and navigate (the most immediate example of this is the web 'site'). It also allows for specific procedures, which can be both recorded and executed according to the machine's processing power and the user's intention. This ability to receive input and allow manipulation of its processes and data makes it, finally, participatory. These qualities are interrelated and together they make for what we think of as defining the experience of computation. The encyclopedic capacity along with the spatial navigability allow an experience of immersion "in explorable, extensive spaces" (p.6) and its procedural and participatory features create the experience of interactivity and the pleasure of agency. Murray's fundamental properties of computation will be

recalled throughout this study, as I describe the representation possibilities this medium allows and the creative technological practices that illustrate my research.

2) *Theory that showed the way*

Throughout the Art Education M.A. program, my interests repeatedly gravitated toward academic studies related to design and new media art education. From readings and discussions, I discovered an open-ended discourse flourishing in this field, which I am inspired to be a part of. This discourse experienced a significant growth in North America in the late 1990s, although various cultural institutions were already engaging critically with New Media in Europe and Japan since the 1980s [2]. The first institutions to embrace New Media in North America were universities and art schools that created programs in New Media Arts and design and hired faculty for these positions. Museums followed by presenting and commissioning digital art (for example, the San Francisco Museum of Modern Art presented *010101: Art in Technological Times* in 2001) and prestigious funding bodies offered fellowships and research grants in new media. Although the establishment of New Media arts as an academic and artistic field is fairly recent, there is clearly a growing flow of exhibitions, conferences and publications on this field. Studies on New Media Art Education have also been proliferating, as educators are increasingly theorizing about their teaching experiences and the implications of developing curricula that uses recent technologies and explores the creative potential of new media. As I was reviewing some of these studies, my process of defining the goals of

[2] Some of these institutions remain leaders in the production and support of New Media Arts, such as the Inter-Society for the Electronic Arts (ISEA) and the biennial Dutch Electronic Art Festival (DEAF) in the Netherlands, Ars Electronica in Austria and the Intercommunication Center (ICC) in Tokyo. Although it would be unfair not to mention SIGGRAPH, the American annual conference on computer graphics and interactive techniques, running this year its 36th edition, although this event is more commercially oriented than its European counterparts.

this research project hit a milestone with my discovery of the book *Educating Artists for the Future: learning at the Intersection of Art, Science, Technology and Culture* (Alexenberg, 2008). It is an anthology of articles written by artist-teachers who address issues of making art and educating artists in a world of continually evolving media, converging disciplines and communities.

This book is particularly relevant for this study in that, although each author writes from a different cultural perspective and in relation to different artistic disciplines, they all argue for the development of new directions in training up coming artists to engage with future scientific, technological and cultural change: a teaching philosophy that I share and have been investigating for the last two years.

Stephen Wilson's chapter *Beyond the Digital: Preparing artists to work at the Frontiers of Technoculture* (p.29) discusses how technological developments are redefining our ways of transforming and perceiving the world. He presents an abbreviated history of art and technology programs from the Bauhaus in the 1920s in Germany through art and design programs in Chicago in the 1970s, San Francisco in the 90s and Georgia in 2006, to name just a few. Through this retrospective he highlights concerns that confront the designers of programs that aim at preparing students for the digital age. Wilson's perspective on the relationship of contemporary programs to the traditional art curriculum and to other disciplines was important to me because he discusses the place of cultural theory in technology based courses and recognizes the challenge of establishing a balance between the emphasis on historical connections with other art and media forms and the new technological developments.

Along with Stephen Wilson, Roy Ascott discusses the issue of teaching skills that

will "transcend the inevitable flux of change"(p.37) allowing students to keep up with the fast pace of change in the field of arts and new technologies. Wilson defines these as "Meta Skills" (p.37) In his text, Ascott identifies a number of such skills that apply across different art disciplines and the succession of media. At the same time, both authors also acknowledge that students wish and need to master the technical manipulation of devices and applications and to show high levels of technical expertise that will make them employable.

Robert Sweeny opens the following section entitled *Networked Times*, with a chapter in which he explores the pedagogic potential of complex networks. Sweeny argues that educational systems should always "reflect and respond to their particular context" (p.95) thus today's art educators should show awareness of the relevance of the research tools that are now available; the communication and social exchange platform that is the Internet; the unprecedented variety of information sources; and the global connections that are shaping new ways of knowledge exchange. These must be taken into account in the development of educational models for training artists in a hybrid environment of real and virtual experiences.

In the last section of this book, *Emergent Praxis*, four authors delve into how their cross-disciplinary research and artistic practice translate into conceptual frameworks, objectives and strategies of art education they have developed and put into practice. In his article *A Generative Emergent Approach to Graduate Education*, Bill Seaman (2008) describes the curriculum of courses from a graduate program offered at the Department of Digital Media at the Rhode Island School of Design since 2003. This program aims to provide technological background, while balancing theory with hands-on learning

experience that contribute to the personal growth of each student's artistic practice. Seaman identifies challenges and strategies to embrace the complexity of teaching contemporary approaches to creative technological practices that employ digital media. Also in this section, Lucia Leão (2008) Professor of Art and Technology in the Department of Computer Science at the São Paulo Catholic University writes about her pedagogical experiences from which she delineates "stimulating tasks" (p.293), which are the fundamental guidelines that direct her work as an educator in this field. Among other tasks she highlights the teacher's ongoing commitment to simultaneously research, learn and teach which are essential to stay updated, particularly when dealing with new technologies. Leão also emphasizes the role of the student as active contributor to the course content and to the way the lessons unfold, by sharing individual research findings and knowledge (p.293). In this model, the teacher becomes a mediator between the members of the class. Lucia Leão employs the theories of Brazilian educator Paulo Freire (1999), whose pedagogy argues for the importance of dialogue, as opposed to a one-way transmission of knowledge from the teacher "depositing" ideas on the student.

These are some of the most influential educators to this study. Each chapter in Alexenberg's anthology helped me articulate my own concerns towards my prospect of teaching in this field, and to write the two primary research questions of this study. The teaching strategies brought forward in the last section, *Emergent Praxis* were particularly helpful in formulating interview questions and topics used with the participants in this case study, and also informed my analysis of the teaching strategies that emerged from the description of the courses.

3) *Theory that ensued*

The third body of literature comprises authors I encountered when investigating topics that emerged from the study or that I referred to better understand these key concepts. The topics are concerned with new media arts or art education theory, or both.

In *Critical Studies in Art and Design Education* (Hickman, 2005) several authors advocate the importance of a balance between art theory and art making in the general art education curriculum. Some suggest how such balance can be effectively achieved. George Geahigan (2005) argues that the critical discourse that accompanies the practical work should be brought forward by means of exercising students' personal responses to art history and contemporary practices. Geahigan stresses that critical inquiry is a more effective strategy for structuring this type of instruction than "classroom recitation" (p.98), which is a linear, repetitive form of talking or writing structured according to assimilated steps. The author deems this as an unworkable instructional method and proposes pedagogical activities to encourage critical inquiry. Leslie Perry asserts that theory and practice are inseparable and proposes in-classroom strategies that will enrich students' responses and critical skills. Perry echoes Lucia Leão's ideas in that such activities should also contribute to the instructor's own updating in the subject he or she is teaching (p.50).

In a study conducted by De la Harpe, Peterson, Frankham, Zehner, Neale, Musgrave *et al.* (2009), the authors analyzed 118 journal articles in order to discover, from the teacher's perspective, what is the most prominent assessment focus in studio courses from the three creative disciplines of architecture, art and design. Although my study does not contemplate assessment of student's work, this article reveals what matters the

most for educators who teach studio courses, hence reflecting their teaching objectives, focus and strategies. Their study demonstrated that in developing and implementing studio curricula, great value is given to the conceptual processes of developing creative work, including art or design critical thinking and incorporating "socially and culturally sensitive issues" (p.39). Their study also showed that teachers in studio arts value students' competence in "hard skills" and "soft skills" (p.42), their individual personal development and, finally, the final product or work. The main challenge for teachers is to balance these aspects. For my study I have adopted De la Harpe's distinction between "hard" and "soft skills". Hard skills pertain to both the mechanical processes that students need to master and to knowledge of the specific theories and techniques in which they are to become proficient. So, on one hand hard skills refer to the technological facility in manipulating the tools and understanding their potential. On another hand hard skills also encompass the history and the theory of the media, which comprises understanding how things came to be the way they are, the issues addressed in past practices, what is being addressed now and why the discourse has changed. By becoming familiar with the history and theory of specific media, students also cultivate the terminology that relates to the discipline, which they will use in the articulation of their own ideas. Aaron Marcus (2008), professor of Media Design at the Illinois Institute of Chicago explains how this is an important form of hard skill when he states:

> It is essential that students cultivate a terminology that can quickly, efficiently, and successfully describe [their] work. [Students] will not only use these terms to explain to others, but [they] will use these concepts as filters to understand the language and work of anyone else, and the phenomena [they] encounter. (p.237)

Soft skills include verbal and visual literacy that is often built upon understanding the theory of the media and mastering the proper terminology, which students use to associate ideas and articulate their own critical thought and work processes. Soft skills include skills of interpretation and integration of concepts in their practical work, exploration and innovation, the ability to articulate their problem solving and decision-making strategies. Although the authors of this article include personal skills like team work and collaboration in their definition of soft skills, I include these skills in the category of Meta skills which I have described earlier in this section as defined by Ascott (2008) and Wilson (2008), because these are competencies that are transferable beyond studio practice and academia.

These three categories are not exclusive to any pedagogical model. I have adopted them according to the definitions they are given by these authors and they became the lens I use to identify sets of skills to be fostered in studio courses and therefore underlie the pedagogic objectives and teaching strategies that emerged from the three courses of this case study.

These are the three bodies of literature I selected to circumscribe this research project. Additional references are occasionally introduced ahead to support or complete links between theory and the findings of the case studied. Most of these additional references were pointed out by the participants during conversation or came through in the materials I collected pertaining to each course.

CHAPTER 3

METHOD

I have employed a qualitative case study methodology to conduct this research, which resulted in detailed descriptions and analysis of the qualities of the three courses. The six features of this kind of study described by Elliot Eisner (1991) apply to this research: 1) it is field-focused, 2) the researcher is the prime tool for gathering data, 3) it is interpretative in nature 4) expressive in language 5) highly detailed and 6) persuasive. This form of research has broadened my knowledge and at times refuted personal beliefs I held, by allowing me to compare my observations to my past experiences as a learner in a similar context and as a practicing new media artist today. Additionally, it extended my understanding of new media art education strategies for my future teaching practices.

I began by collecting all available documents about the Specialization program in Computation Arts and about the specificities of each course. Additional data was collected through in-depth interviews with two of the teachers and by observing how one of the teachers developed and implemented an assignment. I also conducted a smaller observation to the presentation of the final assignment for one of the courses, as the instructor of that course was not available for an interview. During the entire process, I kept a detailed record of impressions and ideas, through writing, drawings, schematic thinking and audio records of the dialogues with participants.

According to Robert K. Yin (1984), case studies are most appropriate when "the phenomena under study are contemporary and not under the control of the researcher, yet there is a desire to answer "how" or "when" questions." (p.67) He explains that case

studies are particularly valuable when a study has to be conducted in a constantly changing set of conditions and research activities might have to be modified as the study progresses. In circumstances where it is difficult to anticipate all the details for a questionnaire, case studies offer flexibility to adapt to a rapidly developing situation. This makes case studies the most valuable approach to study evolving media: technologies are rapidly changing, not only in themselves but also in how they are being used. Curricula for new media arts education is continuously under development, as is the case in the B.F.A. Specialization in Computation Arts program, and the curriculum evolves and changes from year to year.

Ethical practices for the treatment of human research subjects were strictly followed. Participants were informed of the purpose, procedures, risks, benefits and conditions of participation. They were invited to review the transcription of their interviews, as well as to review my descriptions of the courses they taught.

Through the entire research and writing process I conducted an ongoing literature review, selecting relevant materials to guide me through the analysis of the data collected from the field experiences. Very often the field research led me to additional sources many of which go beyond academic journals and books.

Procedures

Data gathering through interview and observation

I first contacted the instructors of the three selected courses within the Specialization in Computation Arts program. Upon their acceptance to participate, I immediately started gathering all readily available documentation: information on the program, the course

descriptions, course outlines, and accessed the course websites. This informed me about the courses' pedagogic objectives, themes and theoretical considerations, assignment descriptions, references, bibliography and other pedagogical support materials pertaining to the courses, prior to the first meeting with the participants.

Throughout the entire process, including in this manuscript, special attention was dedicated to respecting the participants' choice of the level of disclosure they chose for their identity, therefore I use pseudonyms for the three participants.

Interviews: Consent and Setting

Prior to the interview, I provided preliminary information to the respondents: my purpose, what would be done with the information, how the information was to be kept confidential, how long the interviews would take. All this was detailed in the Consent Form to Participate in Research, which participants received before to the interview date. The interview setting was mutually agreed upon. The interviews were semi-structured and lasted around forty-five minutes. I taped and transcribed the conversations. The transcriptions of the two conversations along with all the material gathered corresponding to the three courses constituted the raw data from this phase.

Interviews: Question Construction

I looked into the data gathered about each course to develop semi-structured interviews for each respondent. The interviews were guided by specific topics, but the sequencing and wording of each interview varied according to the specificities of the

course it pertained to. (Brenner, 1985) Following are the topics I addressed during the interviews, which generated useful information for answering my research questions:

- The general objectives of the course
- Technological component of the course (i.e. media used in the course)
- Students' levels of technical skills and tutorials
- Key concepts explored in the course
- Discussion of pedagogical materials presented or suggested (i.e. readings, audio-visual, artwork or artists presented)
- Discussion of the assignments and learning tasks as per the course outline
- Teaching challenges in the articulation of both technological and theoretical inquiry in this course
- Discussion of future directions of this course attending to evolving technology and theory

Follow-up topics emerged during the interviews.

Observation

I asked one of the teachers to extend this collaboration by allowing me to observe the development of a unit or assignment in the course outline. In fact I had the opportunity to observe during the two final units of CART 200, as described in Chapter 4. These two final assignments were practical exercises focusing on concepts presented by the teacher during the semester and touching on media specific to this course. Thus, the observation and analysis of its development in the classroom thoroughly enriched the description of this course. It is important to note that this phase was not an evaluation of the success of

the curriculum. Rather, the in-class observation allowed me to complete my understanding of new media teaching practices, more specifically of the main challenges when putting the conceptual curricula into practice.

Taking on the role of an unobtrusive observer, I attended four group meetings. I did not observe one-on-one teacher/student discussion during individual mentoring. I documented (only using field-notes) a much broader overview of these meetings such as the physical surroundings, participants and actions taking place in the setting. In these observation sessions, listening was just as important as observing. Like the interviews, the observation was also semi-structured. My observations focused on how and what the teacher engaged in:

- Presentation of the assignments: technological requirements and concepts in focus
- Teacher's role in group discussions
- Key words and concepts prevalent in the teacher-group dialogue.
- Sequencing of the development of an assignment or unit of the course plan
- Problem solving strategies, including technical issues and student's conceptual research; mentoring;
- Discussion of students' responses to the assignments and presentations

Data gathered in this phase consisted of field notes in the form of detailed descriptions chronologically organized of what was observed in each meeting as well as references to pedagogical materials discussed in class. Immediately after each session I reviewed the notes and added my own ideas and inferences (Bailey, 2007). This step allowed me to gradually make connections and identify patterns through the succession of lessons, allowing new themes to emerge and to be observed in the following sessions.

Method of Analysis

From the data corresponding to each course, the interviews and the observation I completed detailed descriptions of the courses (Chapter 4), highlighting relevant aspects to the research questions. This required initial coding (Bailey, 2007) of all information pertaining to each instructor and course. In the initial coding I identified key words in the teachers' speech that illustrated the main topics guiding the interview. These topics included but were not be limited to the pedagogical objectives of the course, the skills involved to explore the concepts and the media in the courses, theoretical component of the courses, teaching strategies to promote creative and critical thinking, and challenges to implementing the curriculum.

Once the description of each course was completed, I proceeded to focused coding and triangulation (Bailey, 2007). According to Bailey (2007) triangulation is "*central to ensuring the quality of field research*" (p.76) and it can come in different forms. Using multiple methods for data collection is a form of triangulation, as is the involvement of multiple researchers. Data from different sources can also be triangulated. This last approach is the form of triangulation I used in this phase of the study. At this stage, triangulation involved the juxtaposition of the data collected from the three respondents by means of a focused coding of the interviews. The focused coding looked for commonalities and differences in the participants' answers on similar topics. Cross-case generalizations and specificities to each course emerged from this step, providing insights into the primary research questions.

Attending to the same topics used for the interviews' initial coding, I coded the field-notes collected during the observation. It was appropriate to use the same guidelines to

code both the interviews and the observation, as this allowed establishing a parallel between key topics discussed in the interview and the same topics as they were observed in the classroom. While content and key ideas identified in the analysis of the observation enriched the description of its corresponding course, they also provided particularly relevant information to address the second research question.

Rendering the findings and framing the results within reviewed literature

The discussion of the findings (Chapter 5) discusses five predominant themes that emerged from this study. While writing it, I placed the findings from this study into the context of recent literature on new media educational practices and other closely related themes. The Conclusion renders the answers this field-research provides to the research questions.

CHAPTER 4

COURSE DESCRIPTIONS

CART 200

The first course I examined, CART 200, is an introductory-level course. For 14 weeks, the group of 15 students met weekly for four hours in a studio classroom and/or a computer lab, depending on the work plan of the lesson. There was a studio component to the course as well as a theoretical component that took the form of lectures and group discussions. At pre-determined times throughout the semester, students presented their work followed by group critique.

The introduction to the CART 200 course outline for the winter 2009 term stated:

> New technologies have transformed the everyday life, and consequently, the products of culture. Computers are not only used to process data, but are also used to create contemporary art, poetry, music, sound art/design and games. "New media" may, therefore be defined as the byproduct of emergent developments in digital technology. No longer are the arts limited to the traditional media, such as painting on canvas. Artists now utilize computers and mechanical devices in the creation of objects, artworks, and experiences. (In course outline for CART 200, Winter 2009)

Conceptual framework

The general purpose of this course is to expose students entering to the Computation Arts program to different digital media and to become familiar with the kind of artistic practices such media allow through creative research and hands-on experimentation.

Students produce individual and collaborative creative works that explore the interconnections between static/moving imaging, sound and interactive media in the physical or simulated space. An emphasis is placed throughout the course on understanding the "rhetoric of the media", which is defined in the course outline as the ways of constructing meaning, forms of representation and narrative through the effective creative use of the tools. The program also includes lectures and discussion of pedagogical materials (on which I elaborate ahead in this description) which provide a larger contextual background on how digital technologies intersect with visual culture.

The objectives of the course are outlined as follows:

> Upon completion of this course, students will become conversant with aspects of the historical, theoretical, political, ethical, cultural and technical dialogues which frame the field of interactive arts. (...) [Students will] become aware of the various modes of cultural production, discourse, and dissemination. (...)
> Students are expected to complete all assignments, including reflective documentation, which articulates their concepts and demonstrates their processes. (In course outline for CART 200, Winter 2009)

The conceptual framework of this course is based on emergent models of digital media production that explore recombinant media and "remix" – a creative approach that involves processes of collecting found resources, subverting the integral qualities of existing media, then manipulating and recontextualizing these resources into new experiences with new meaning.

Technical component

In CART 200, students work primarily with audio-visual and interactive technologies, including but not exclusively digital technologies. At the very beginning of the course Mark[3] — the instructor, informs students that this course will not be a software tutorial course. Rather, it is based on a DIY (Do-It-Yourself) model in which students are encouraged to use all software and hardware tools at their disposal, from the dominant commercial software packages to open source applications. They can use high-tech as well as low-tech devices, deprecated audio and video capture technology such as web cams, mobile phones and low definition microphones. In all cases, students are to reflect upon the inherent qualities and connotations of the media tools they choose to utilize.

In their experiments with these tools, students are expected to devote significant time to resolve technical issues by making use of all available training resources, such as online forums, services offered by the university's Center for Digital Arts (CDA) and the Computation Lab technician, including labs, equipment and hardware/software workshops. First and foremost, students are encouraged to share knowledge among themselves.

In class, the instructor introduces the basic modules of technical considerations necessary for each unit or assignment. The studio component of the course is also an opportunity for students to address the technical challenges that arise as they work on the assigned projects. In this way students become familiar with the core technical skills to manipulate different media tools and aesthetic choices they can explore. Depending on the lesson topics and on the assignments, some of these aesthetic choices deal with

[3] Pseudonym

pacing, layering, texture, focus, effects, synchronization, lighting and framing. During the lectures the instructor also presents examples of such choices that illustrate how other artists work different media. In the next section, I will elaborate on particularly exemplary artists presented in relation to each unit. The artists' works were either shown in class, in organized field trips or in shows and other events recommended to the students as extracurricular activities.

Overview of the topics and assignments

The program of CART 200 was designed around a sequence of four exercises that complemented each other by means of their content and pedagogy. New topics concerning recombinant media and the remix model of production that students learnt about were introduced weekly (see Appendix I CART 200 – Class Schedule). Some of these topics included acoustic ecology, aural literacy, recombinant practices, site-specificity, experience design, interactivity, real-time performance and ambient video.

Next, I lay out the assignments and the main topics addressed as per the class schedule. My description of the assignments summarizes the instructor's outline, which is greatly detailed. Between assignments, I describe the work of one influential artist presented in class, and how it related to the key-concepts of the unit. Other references are also mentioned in the *Observation* section. This, I hope, will provide a good understanding of the sequential relationship between each unit and assignment – an important characteristic of the way the curriculum of this course was designed.

Assignment #1: *The tuning of the world* (Week two to week six of class schedule)

The key concepts students reflect upon through their first assignment included the aurality of the built environment, perception and the Western tradition of privileging ocularity. In this exercise students interpreted a specific geographical location within the city through its inherent acoustic characteristics. These environments could range from a very intimate, familiar or personal space to industrial, public and abandoned commercial areas.

The project was a fast turnaround of three steps. The first step, *Collection* consisted of a field recording exercise where students were asked to identify the architectural and acoustic qualities of the space. Suggested considerations were the size and surfaces of the space, and the volume, variety and qualities of its sonic environment. Students then selected and recorded small samples of natural, artificial and man-made sounds.

The next step, *Deconstruction*, explored the translation from lived experience into textual description. Students wrote and recorded a line of text that described the location or an interpretative reflection on the space. Inspired by the work of "cut-up" artists like William S. Burroughs and Brion Gysin [4] whose work was discussed in class, these sentences were to be deconstructed and reassembled into a 60 second audio collage. In doing so, students were encouraged to manipulate the words and syllables through compression, time-stretching, filtration and layering.

Finally, *Reconstitution* combined elements from both previous exercises into a two-minute sonic composition. The result was, according to the assignment description in the

[4] Experimental American writer William S. Burroughs (1914–1997) developed with painter Brion Gysin (1916-1986) a 'cut-up' method that employed cutting and blending several random texts into one hybrid narrative. The intention of this practice was to avoid conventional language patterns and to restructure readers' consciousness.

course outline, "not intended to be a literal recreation of the environment, but rather, an atmospheric soundscape that reconstitutes a number of different source materials. (...) [Students] consider how this piece complements, enhances or negates the pre-existing acoustic conditions of [their] selected space." Students reflected on how silence, volume, layering, transformation, texture and pacing contributed to the mood and to the unfolding of the audio collage.

Between the *Deconstruction* and *Reconstitution* steps, on week five, students visited the exhibition *Replay*, by Christian Marclay at the DHC/ART Foundation for Contemporary Art [5] in Montreal. The exhibition featured Marclay's works produced between 1997 and 2007. Works like *Telephone* (1995), *Video Quartet* (2002) and *Crossfire* (2007), clearly attest to how the artist privileges sound. He works from original sounds out of the most available popular sources such as Christmas LPs or Hollywood films, remixing them into new sonic (at times musical) experiences. The images he selects for the audio-visual works mostly serve the purpose of the aural narratives or musical compositions they can generate. Marclay's artistic approach has been defined as composing, video art, collage, performance, even sound sculpture. He works across multiple media to create full sensory experiences that fuse popular culture and fine arts. The body of work presented at *Replay* is a good example of a contemporary artistic practice that addresses the key-concepts explored in this course. Through processes of collecting, deconstructing and remixing of audio samples, Marclay's work was particularly relevant to the *Tuning of the World* assignment.

[5] www.dhc-art.org

Assignment #2: *You are here* (Week six to week nine of class schedule)

The result of the previous project became the basis for a two-minute video work, again using the initial chosen location. It was recommended that students first determine a conceptual approach (i.e. consider how the space is utilized and by whom and if it changes throughout time or their personal relationship with the space). This concept determined the format and the aesthetic qualities of the visual representation, which should be integrated with the initial audio work and effectively contribute to establishing a mood in the composition.

The outline for this assignment included technical and procedural recommendations on using image capture devices, types of images and possible editing choices. Additional equipment, such as lights and tripods, was also suggested to improve the quality of the "raw" material students would be collecting. It was mandatory that all material be self-generated and edited individually. No borrowed audio samples or video images were permitted.

On week nine, as an introduction to assignment #3, the group viewed the film "My Winnipeg", by Canadian screenwriter and director Guy Maddin (2008). The instructor pointed out how Maddin mixes different filmmaking approaches: the movie is a hybrid of documentary, news report-style, story telling, animation and film-like narrative through which Maddin interprets his own town and his childhood. "My Winnipeg", Mark also mentioned in class, suggests a new way of telling stories, where the subjective personal memory supplants the historical accuracy of the facts. The key word of Maddin's approach is, again, the remix, not only of the source imaging that he uses (these consist of his own footage of landscape and staged recreation of memories, archival imagery and

illustration) but also the remix of multiple narrative styles which time-based media allow. With this in mind, the group moved on to the following exercise.

Assignment #3: *Dialogues* (Week nine to week twelve of class schedule)

This exercise was devoted to constructing two linked audio/visual sequences around the theme *Dialogues*. Paired with a classmate, Mark asked students to produce a two minute, two channel audio/video diptych. The theme could be interpreted in multiple ways, preferably moving away from the literal questions-answer kind of interaction. *Dialogues*, in a broader sense, could evoke ideas of complementarity, contrast, synchronization, rhythm or chaos.

The final work consisted of two video sequences linked to one another by the interplay of its content. It was up to the teams to determine how they would direct the viewer's attention when experiencing the two-folded piece. It was important that their intentions were equally manifested in the sound and the video component of the work. The process of this particular project required that teams divide responsibilities and determine the structure and aesthetic qualities of the work.

The group was about to begin the final segment of the semester when the movie *Rip: a remix Manifesto* (Gaylor, 2008) was released in one cinema in Montreal. This movie deals precisely with the concept of remix. It is composed entirely of media from various sources: found media, footage and interviews for the movie, all remixed into a collage to make this documentary-style narrative. The movie is heavily critical of issues of copyright in the 20th century information age.

Mark strongly recommended that students view the screening or access the movie online[6], where it has been posted in 13 chapters and made available for the viewers to use in their own remixed work. The movie speaks to the deconstruction and reconstitution practices students had already explored and would be taking further in the last assignment, *Shred*. It also introduced students to contemporary socio-political implications concerning the remix model of production.

Assignment #4: *Shred* (Week twelve to week fourteen of class schedule)

The final exercise aggregated all concepts assimilated up-to-date as well as all content produced. The class was divided into small teams of three to four students, and the groups were to use only the materials the members of the group had produced in this course to create an interactive performance. However, the materials could be manipulated, deconstructed and reedited to any degree using any number of technologies and strategies.

In their approach to interactivity and real-time performance, the teams were encouraged to go beyond popular digital processing software such as Max/MSP®, Flash® and VJ systems and to experiment with the interference of physical objects or bodies with the digital projections. They could use lenses, mirrors and other optical distortion devices to achieve real-time effects, layering of different projections, audience participation, closed-circuit technologies, and so on. As mentioned in the course outline, in this final assignment, students would come "full-circle in the content creation-deconstruction process".

[6] http://www3.nfb.ca/webextension/rip-a-remix-manifesto/, retrieved July 20 2009

Requested deliverables for the three first assignments were in digital format. The interactive performances were recorded by the instructor. For all assignments, students were asked to always include a reflective statement articulating the concepts and work process, as well as to be prepared to present their work during the class session on the date the project was due.

Observation

In CART 200 I conducted in-class observations from week ten to week fourteen. I requested to attend these classes in order to better understand the concepts of this course and to see the development of one unit of the course plan. What I actually observed was the development of the two last assignments: *Dialogues* and *Shred.* I was not present during the practical component of the course that took place in the labs, in which the groups met to develop their concepts with the teacher and produced their work.

As outlined in the methodology section, my interest in the students' presentations was mostly concerned with the terminology prevalent in the teacher-group dialogue. In this sense, the observation process was largely about listening and note taking. It also allowed me to grasp the mentoring process to address students' conceptual and technical choices.

For four sessions I sat among the students, observing and taking notes. When I revisited the data collected in these sessions, I identified three main themes, which dealt with teaching strategies: a) Introduction of thematic units and assignments, b) Discussion of resources and pedagogical support materials and c) Students' presentations, or the critiques.

a) *Introduction of thematic units and assignments*

The discussion of the focus topics and the introduction of the assignments made up most of the lecture component of the course, along with the presentation and discussion of artistic practices. These lectures were designed to provide students with the cultural backgrounds and references on the past and contemporary practices relating to the unit's topic. Mark had prepared all his pedagogical support resources, which he accessed online and projected on the screen to illustrate specific topics throughout the lecture. The links to these resources stayed available in the course website for students' future consultation.

Both assignments I observed were first situated in terms of all the theoretical and technical considerations that had been introduced to date. The instructor then introduced the new topics to be explored. The two assignments I observed were collaborative.

The thematic differences resulted in distinct teaching strategies to introduce each assignment. In *Dialogues*, for example, the topics of week ten were *Interplay* and *Intertextuality*. These ideas were to be explored by students working in pairs, each creating an audio-visual piece that would be played simultaneously with his or her partner's. The goal of this exercise, the teacher explained, was to understand how the interplay of two media elements could generate conceptual complexity and multiple layers of meaning. I observed that students' first concerns related to the possible interpretations of *Dialogues* and to answering the question "*How can it work together?*".

Recalling some of the examples shown during the lectures, Mark reiterated the possible approaches suggested in the outline, such as complementarity, contrast, movement and synchronization. This instigated a group discussion on what the idea of

Dialogues suggests during which students elaborated on themes and imagery that relate to the concept.

The nature of the imagery was also a topic of discussion. Mark recommended that students collect their own materials, however he also referred them to sources such as archive.org, where they could find media that is licensed under Creative Commons [7] and can be used for non-commercial purposes. He strongly discouraged students from using copyrighted materials. In my observation notes I wrote the following teacher's quote: "If you look at your environment at a microscopic scale you will start finding very interesting everyday phenomena to be captured". (Personal journal, April 8, 2009)

In *Shred* the introduction of the exercise did not raise the same concerns since students were to use nothing but the work produced up to week twelve, including *Dialogues*. By coming together as a group, students had to relinquish the authorship and control over the work they had produced as it all was to be deconstructed and reassembled into a new experience. The topics explored through this exercise were *Emergent and Interactive Media* (week twelve) and, *Real-Time Perfomance* and *Responsive Systems* (week thirteen). This final exercise was therefore less resonant with the purpose of interpretation than with that of engagement and with creating an immersive experience. The discussion during the introduction to the assignment dealt mostly with examples of analogue and digital technologies that could be combined, strategies to integrate the physical environment into the piece, and to engage the audience to participate. The teacher brought in examples of low-tech devices to manipulate the

[7] Creative Commons is a non-profit organization that helps creators grant copyright permission to their creative work as a way to enlarge the body of work that is available for public sharing. http://creativecommons.org/about/what-is-cc retrieved on June 4th 2009.

video and the audio. Some of the analog examples included magnifying glasses, mirrors and filters to distort projections, objects to project onto, silhouettes or shadows, choreographed movement or human voice that could be incorporated by assigning roles to the audience during the performance. Possible digital media included sound distortion pedals, turntables, simple sensors or closed circuit technologies. It is important to mention that the groups were selected by the instructor, therefore teams had to plan the work by articulating the strongest skills of its individual members.

Examples of artists' work were presented after the introduction to this assignment. These examples played a major part in broadening student awareness of emergent media practices that integrate multiple media, deconstruct and reinterpret content, direct user experiences, and generate response.

b) *Resources and pedagogical support materials*

There were no required texts for this course. However resources were provided gradually in the course website and remained available for the duration of the course. In class, these resources were generally accessed online, through artists' websites and video sharing websites such as YouTube, or from original DVD documentaries. The introductions to both units were completed with the presentation of selected examples of past and contemporary artistic practices relating to each unit's conceptual or technical considerations. In section *Overview of the topics and assignments* I have mentioned some of the artists presented. For this section I have selected a few from the many examples that were discussed in class during my observation sessions. For the purpose of

summarizing for this report I will mention only those I observed to be somehow referenced in students' work.

The topics for week eleven, during the *Dialogues* project were *Movement, Rhythm and Stasis*. These aspects are explored by Brian Eno in his late 70s minimal audio work which uses collected radio broadcasts, sampled recordings from around the world and altered guitar tunings. Eno's work also extended to video. In 1981 he developed "video paintings" in which the moving image was manipulated to a very slow frame rate, at times making the movement almost imperceptible to the eye. During the 90s he developed self-generating musical systems and coined the term "generative music". In 2006, Eno added video processing capacity to this generative program and released the first version of *77 Million Paintings*. The viewer interacts with this work by operating sliders to view an overlay of 300 images and sound prepared by the artist through an application that allows an estimated 77 million possible combinations. (Eno, 2006)

It is important to note that Brian Eno is an extremely prolific artist who works across the realms of Fine Arts and mainstream popular arts. He was affiliated with the Fluxus movement in early 70s, he produced artists like David Bowie, U2, Coldplay and many more throughout the 80s and 90s and designed the generative music for the video game Spore® in 2008, to name just a few of his collaborations. ("*Brian Eno Discography*", 2008)

The video techniques developed by Brian Eno for manipulating the pacing and flow of the imagery were echoed by other artists like Douglas Gordon, in his *24-hour psycho*. Mark explained that Gordon slowed down Alfred Hitchcock's film *Psycho* (1960) to 24

hours in order to break the cohesive sense of the storyline and focus on the imagery, thus changing the viewer's relationship with the film content.

Mark also showed the work of Doug Aitken, whose work explores the multi-channel type of composition also in focus in *Dialogues*. Aitken creates immersive experiences "by fracturing the narrative structures of his films across multiscreen environments" (*Sleepwalkers, Doug Aitken – Artist bio*, 2007). He manipulates the movements and the pace of the moving images to direct the viewers' attention in the space. Such examples initiated in-class discussion on what happens when the artist moves away from linear narrative to explore other modes of representation, and on how different aesthetic choices can interfere with the way the work is read.

Closer to the end of the semester I observed the introduction to the final unit, corresponding to the assignment #4, *Shred*. This lecture was about emergent and interactive media, directing user experience and remix practices. Mark included a wide range of artistic practices as references.

On March 25th, between weeks twelve and thirteen, electronic artist Rafael Lozano-Hemmer (who received a Bachelor of Science degree from Concordia University) presented his international artistic practice in an open lecture at Concordia. Although not mandatory, the class was recommended to attend the talk, in which the artist discussed several of his works, deploying interactive technologies and large-scale custom-made physical interfaces.

The main characteristics of his body of work from 2000 onward certainly spoke to the challenges students would be undertaking in the final assignment. Lozano-Hemmer

often sets his work in public spaces in order to include the public in the experiences he creates. The works presented demonstrate his versatility in combining a variety of media and tools, often subverting the purpose of ubiquitous technologies. Furthermore, the scale and custom-made interfaces of his public installations also require team collaboration with experts in different disciplines.

Mark pointed out several other works by established artists as a way of directing the discussion into pertinent strategies for this unit. In order to demonstrate that the combination of multiple media into creative real-time performances is a practice being adopted across artistic genres and communities, the instructor also presented independent groups and mainstream artists. Among the examples discussed were works by the Graffiti Research Lab (GRL)[8], a collective that creates computational open-source tools for graffiti artists to develop non-invasive public interventions. Yet another example was the Canadian musician Feist who adds another layer to her fans' experience of her live singing performances by having two visual artists manipulate images and finger-painting directly onto a projector, thus creating a real-time animation in the background while the singer performs. (Teasdale, 2008)

The exposure to a broad range of artists proved to be a good teaching strategy, particularly for this more open-ended exercise. As I show in the following section, it helped students in the hard task of selecting the media and the endless possible combinations of analog and digital technologies – most of which were once again new to the learners. The examples discussed during the lecture helped to illustrate key topics of this unit such as immersive environments and directing user experiences. When articulating their work during presentations students highlighted qualities of the

[8] www.graffitiresearchlab.com

experiences they intended to offer to their audience, which were also characteristic of artists' work shown in class.

c) *Students' presentations*

The purpose of this section is not to provide detailed descriptions of the works presented by the students. As mentioned in Chapter 3: Method , in observing students' presentations I intended to collect data on the teacher's role during group discussions – which is different form the role the teacher assumed in lectures. I was also hoping to grasp the key words and concepts prevalent in group dialogue and witness the students' in-class responses to the assignments and presentations, specifically on how the topics and references introduced in the lectures reflected in their choices.

These discussions took me back to my personal experience as a learner in the same field: I recalled that final presentations are never final. Rather they are yet another important phase of the learning curve. I observed how the teaching-learning roles intermingle during these meetings. Students take the front of the class and articulate their process and concepts to their peers. They report their initial intentions and the challenges they encountered. At the same time, it is in the moment of its presentation that the work manifests value of its own. The viewers/peers sometimes identify characteristics initially unintended by its producers. The teacher's role is just as important at this point. The teacher acts as a moderator of the discussion by posing key questions to highlight the successes or the limitations of the work according to the topics and objectives of the assignment.

The two presentations I observed corresponded, as mentioned before, to the third and fourth (final) assignments. They took place in a large, very bright room – perhaps too large for the size of this group and too bright to do justice to the video and projected artworks. Presenters began with a brief description of their work, focusing on their intentions, the general aesthetic characteristics of the piece, punctuated by technical difficulties they encountered or how the specificities of the tools they chose influenced the final result. For example, a team of two students interpreted *Dialogues* as duality and movement by throwing objects that traveled from one screen to the other. Working in a limited space and with one camera, the transition of the objects between screens was the result of video editing, causing discrepancies in the position and speed of the objects when transitioning from one screen to the other. However, students chose to emphasize these discrepancies which made for an assumed aesthetic characteristic of the work.

In the different approaches to *Dialogues*, I was surprised (and pleased) to see that students chose to capture their own images, even if they had been given the option to remix readily available open-source media. For the audio component of the two-minute diptychs, some students did choose to appropriate and manipulate samples from digital found sources, although a majority of the teams composed their own soundtracks.

Because of its open-ended nature, the exercise *Shred* resulted in more disparate approaches, when compared to the previous exercise. Students were free to select, deconstruct and remix their production to any extend, using the media and the tools as they saw fit. The real-time performances had more of an experimental character and were assumed to be a sketch of ideas on how the work could evolve further.

Technically, the groups clearly drew on the expertise of each member, in many cases venturing to experiment with tools that had not previously been used in this class such as live DJ and VJ mixing tables, Flash® programming and several image distortion techniques. All groups employed both digital and analog tools.

I saw groups explore layering or juxtaposition of projections and inviting participants to interfere through their shadows and objects, which referenced the playfulness of Rafael Lozanno-Hemmer's works. A strong exercise was an online application created using Flash®, which students in the audience could access through their PC. Directed by one of the students, peers became participants by activating a sound sample pressing pre-programmed keys on their own computers. Simultaneously, images were projected onto the "maestro's" long white garments and the background. Although the PC's speakers did not allow for a totally immersive experience, there was a spatialization of sound in the room. Participants were successfully engaged in the performance, and the overall experience was enriched by the use of large scale imagery.

Following the presentations, the student audience was first to provide feedback, in the form of mostly positive and constructive critiques. They suggested alternative ways to emphasize specific intentions achieved by the teams. For example in *Dialogues,* students commented on the overall feelings conveyed by the work, on the choice of imagery and editing strategies (layering, pace, rhythm, effects), on the narrative styles and on the interplay between the two parts. Some students were curious about how certain effects were achieved or suggested technical adjustments that could better finalize the work. I found the peer-to-peer discussion to be an essential part of the development of these

units, as can be understood by the following quote from the notes I took immediately after one in-class observation:

> Students' understanding of the key concepts previously presented in class comes through not only in the qualities of their practical work but in the way they articulate it, the vocabulary they employ to describe and comment on other's work. (Personal journal, April 1, 2009)

As I indicated before, at this stage the instructor became a moderator of these discussions. He emphasized the primary themes of the units in the critique and reiterated the questions *how* and *why* the decisions were made to evoke the intended concepts. His feedback was also punctuated with technical advice. Students' work sometimes evoked artists' projects not previously mentioned. Mark promptly established connections and invited the group to investigate these references further on their own.

Interview with the instructor

I met with Mark a few weeks after the end of the semester. The interview took place in late afternoon in his office, with its windows over the busy downtown street at rush hour. I glanced over the book shelves and recognized some covers and most authors. My eye stopped on some fresh prints on the desk of what seemed to be type foundry posters for new typeface releases. All of this made the setting for our talk quite familiar to me.

As I set up the tape recorder, it occurred to me there was some irony in this outdated piece of technology: it was an archaic analogue recorder, quite intrusive in its size and noise. The running of the tape became the ambient sound of the entire conversation, and was captured by the device itself.

So far, Mark had provided me with plenty of materials concerning the course, and gave me the opportunity to sit in his class and observe all that I have described in the previous section. The data gathered provided insight into the topics I intended to investigate through the interview, and in some cases, already answered some of my questions. This interview slightly differed from the one I had with Richard, the instructor of the next course I describe, in that I did not address topics already clarified in the previous steps, such as the objectives of the course, key concepts explored, pedagogical materials and the assignments. Rather, it focused on the rationale behind the strategies structuring this course as well as some teaching challenges to delivering the program. Although our conversation sometimes drifted in directions tangent to the foci I had set myself to elaborate on, in my analysis I could clearly identify the prominence of the four themes that follow.

Theme 1: *The development of the conceptual framework*

I was aware this was the first time Mark had taught CART 200, so I was curious to find out how he had initially conceived the course's conceptual framework and imagined the assignments. He explained:

> *When I was assigned the course I received three different course outlines from three previous instructors and they all treated the subject differently according to their different areas of expertise and interests. (...) I really wanted to explore throughout the course, the remix as this new kind of emerging cultural model of production.*
> *Usually when I'm confronted to designing a course I think of projects I would like to do. And then... well, I start from the basics, and think how does that germ of an idea connect with more specific theoretical ideas? What are the technical issues that are required in order to be able to accomplish that? I usually have three times as many*

ideas for projects than I can actually use. So then I start to see how this one project bridges to the next one and build incrementally. (...) The first project was about the field recording, so they had to see how to actually get existing sound into a digital format. Next, how do we work with that in order to create something new? That was done. Then we moved on to see how does that audio now dictates what we are going to see working with video. How does that work together, sound and image? That's how we progressed, and at the very end we could throw everything back in the pot and see how we can reconfigure all that. (Mark, Personal communication, April 28, 2009).

The way Mark approaches his course design is a creative process in and of itself. The strategy adopted for this course was to keep a consistent thematic thread along which both conceptual and technical considerations were introduced and carried on into the next unit. It resulted in a fourteen-week cumulative learning process.

Theme 2: *The technical component*

It had come to my attention during observation that, at the introductory level, students arrived with very different levels of technical knowledge. We discussed how this impacted the planning and teaching of the coursework. Two challenges were mentioned in what comes to the technological component of the curriculum: the challenges of accommodating the students' different technological backgrounds and accommodating their different learning styles.

I try to assume that students all come with no technical expertise, and I try to introduce different modules of technical developments so that they become somewhat competent, but it's also a process of learning technique for acquiring that kind of knowledge elsewhere. There are some great resources online and even support within the department. So what I try to do is to introduce themes, expose them to

other artists' works and build the assignment around those themes, and focus in conceptual ideas. That way, regardless of technical proficiency there is still a way to work with really basic editing but still create something interesting. Because the theme kind of dictates where the project goes.

I think that some people are comfortable with that, they like the more open structure and they can adapt. Other people really need more step-by-step instruction and that also goes back to their previous experience with technology as well. It's difficult to accommodate different learning styles. (Mark, Personal communication, April 28, 2009).

Mark is, as are many artists working with digital media (including myself), mostly self-taught in the technicalities of the media he uses and teaches.

It's a really hard balance because I know that, from having taken a few workshops, I came out of it knowing only how to do one thing because it was taught by button pressing or mouse clicking and so I knew exactly how to replicate what we were learning, but there was little application for when I wanted to do something else. Some people learn ok by that model, but I prefer to have more of a problem-solving model where you come up with an idea and then you work on figuring out how to achieve it. (Mark, Personal communication, April 28, 2009).

As explained in the previous section, students were free to use the tools of their choice and encouraged in every assignment to explore analog devices and traditional media, in addition to digital media. Mark's perspective concerning the wide range of media students were encouraged to explore is worthy of note. It came through in his explanation of a small introductory exercise he proposed to establish a first rapport with the students and discover their interests, goals and media preferences. Students were asked to mail this information in a hand-written short bio to his office. Mark explained the rationale behind it as follows:

For me it was partly pragmatic. I had difficulty in remembering names, so for me it's kind of a mnemonic device. I can connect to a particular story that helps me to remember who they are, and it also provides a bit of a personal connection. It's not really practical for me to sit down and have a little chat with every student at the beginning. So in this way I ask them to tell me specific things about them, also what their objectives are so I can customize the course, in order to meet some of those objectives.

But also the fact that I ask for it to be written and mailed, for me it's a whole reference to the old media, and I think a lot of students that are entering in the computation arts want to use all this high end software, all the latest and greatest, at the expense of what is so wonderful about traditional media and, you know, [This exercise] *is just to completely scrap that, as new technologies just become another element to the mix of the palette of different tools that we can use. So, it's in a way to achieve a kind of pedagogical and philosophical aspect on top of its very pragmatic aspect.* (Mark, Personal communication, April 28, 2009).

Theme 3: *Mentoring the students' concept development and aesthetic choices*

Most use of media explored in this course –video, sound and interactive applications are commonly known for having been predominantly directed by the commercial interests of the entertainment industry. So I inquired if students were influenced by the aesthetic qualities of the mainstream media productions and if so, how did this affect the teaching strategies? According to Mark, this hadn't been such a challenge with this particular group. Yet, it had certainly come up in similar courses. Having been exposed to the industry as passive consumers for most of their lives, some students may look to recreate styles they are familiar with. So, when this appears, Mark asks the key-question:

Why are you telling stories about things that you haven't experienced? Why don't you start with things that are closer to you? Because you will be more passionate about it and you will have more knowledge about that and, you know, often times the

simplest stories are the most moving. Because they will be relatable. So, that kind of extends to the technology as well. It's like: ok, you can build up to that but why not just use what you already know and experiment with it? See how you can push [these tools] *to its limits?(...)*

For me it's more about breaking down the filters that we put on in our everyday life. We ignore so much in our surrounding environment and what I wanted to encourage them to do is to remove some of those filters and engage in observational processes just to use attention and focus to things that are often ignored. Because some of those filters they lead to stereotypes and they lead to generalizations and all that sort of things, and you begin to speak in clichés (...) (Mark, Personal communication, April 28, 2009).

The program was clearly designed to encourage students to generate their own materials, collecting the raw data from their immediate environments, using their own tools. Furthermore, the variety of artists' work brought in as references certainly inspired students in alternative creative ways of composing with new media.

Theme 4: *The place of collaborative work*

It is important to include Mark's view on the place the collaborative work has to play within the "remix" model of production explored in CART 200. More specifically, my question was related to the last exercise *Shred*, which not only deconstructs the artwork produced, but also takes us away from the model of the individual artist as author that has traditionally been fostered in the teaching of fine arts. In relation to this, Mark explained:

Well, I really wanted to explore throughout the course, the remix as a new model of cultural production, which also relates to a lot of media development where you just have to collaborate in order to work on large-scale projects. It's virtually impossible for one person to complete something significant on their own, and to have the

appropriate expertise. So for me it was about playing on strengths of individuals and really being able to access... to have certain level of competency in all areas but to be able to converse with someone who might have greater knowledge, and to be able to explain a concept appropriately. But that whole model of the remix is also about breaking down that singular, kind of "ethos", the ego-driven kind of production and really see it more as a playful exploration and exploiting what already exists, bringing it back together and re-working it. (Mark, Personal communication, April 28, 2009).

As demonstrated in the work of artists like Brian Eno or Rafael Lozano-Hemmer, large productions that use multiple media are very difficult to achieve alone. To conceive and produce such work involves not necessarily being an expert in every area, but being able to at least communicate with collaborators and to know the potential of the technologies in order to achieve one's vision. In the course of their studies in this program students can choose to focus on a specific medium, but in CART 200 the goal is that students become conversant with a variety of media and technologies that frame the field of computation arts.

This field is also being shaped by a medium that was referenced but not directly explored in CART 200: the languages of computer programming. Hence students are also required to take CART 210, which I describe next and deals precisely with computer programming as a form of creative expression. CART 210 illustrates yet another dimension in the training of new media artists and teaching strategies that responds to the specificities of that discipline.

CART 210

The second course I investigated, CART 210, is also a required course in the Specialization in Computation Arts program. It is offered in the second semester during students' first year of studies in this program. Students must have completed a prerequisite course in the first semester to enroll in CART 200 and CART 210. For a better understanding of the background students bring to these two courses, I consulted the prerequisite course website.

The prerequisite course explores the use of the World Wide Web and networked media for creative practices. There is a strong theoretical component as well as a studio component. In the theoretical component students are suggested readings on media history, social networks, technology culture and digital arts. In the studio component students create networked web art while experimenting with the common web creation software such as HTML, ImageReady®, Dreamweaver®, Flash® and some video editing tools, as a way to tackle the technical and conceptual challenges of working with digital and networked media.

Thus, the prerequisite course is a broad introduction to computational art through which students become aware of the potential and implications of art using screen-based, networked media. It also provides general insight into the students' possible choices of media tools as they complete the program. In the following semester CART 210 is one of the required courses that ensue this prerequisite course.

In CART 210 students go into detail on the underlying processes of computation: the programming languages, as a tool for creative expression. I investigated this course by accessing the course website, I experimented with the programming language by

resolving some of the course exercises and I completed the data collection with an interview with Richard [9], the instructor.

There is very specific terminology concerning the technicalities of computer programming. In the context of this research, I will only use and define the necessary concepts to describe the fundamentals of this course.

Conceptual framework

CART 210 is an introduction to computer programming for generating visual and interactive works. During the fourteen weeks of the course students gain understanding of computing in general, and more specifically, they learn how to design computer generated graphics and interactive compositions using Processing, a programming environment on which I elaborate in the following section, *Technical Component*. In addition to learning and implementing creative generative coding, there is a small theoretical component to this course in which students investigate the evolution of computing and its cultural implications, highlighting the various possibilities for integrating computer programming into multimedia projects and installations.

The objectives of this course are outlined in the syllabus as follows:

In this course, students will
- study the history of computing in the context of new media art and technology.
- become aware of the computational approaches to multimedia projects
- learn the theory and practicality of the fundamental building blocks of a programming language, which will help them to make use of any other language in their future work.

[9] Pseudonym

- understand how to analyze a problem in interaction design and how to construct a solution that addresses the problem.
- be prompted to think critically about programs by participating in collective critiques of their work.

(In course outline for CART 210, Winter 2009)

Technical component

In CART 210 students learn to use Processing, an object-oriented programming language (OOP) to develop screen-based graphic interfaces. Processing was developed in 2001 at the Massachusetts Institute of Technology (MIT) Media Lab by Ben Fry and Casey Reas. It is an open source programming language and development environment that has also become an online community of individuals who contribute to its growth by developing and sharing code, answering questions in the online forum discussions and building libraries that have since extended the applications of the coding into audio, video and communication with other devices. ("*Overview*", 2009)

Processing is specifically developed to generate images, animation and interactions and therefore interests primarily students, artists and designers for learning, prototyping and professional production in a visual context. Its increasing popularity within these communities is due to the fact that it allows users to develop their own creative tools without being confined to the existing (copyrighted and pricey) software, and that it is continually being developed by a committed community. Processing is immediately available for download, it runs on the most commonly used platforms (Mac OSX, Windows and Linux) and it's free.

In CART 210, students started generating their first motion graphics in the first weeks. Once the instructor introduced the basics of writing code with Processing, the

learning curve was very steep, especially for students who went beyond the in-class lessons and explored the Processing tutorials and examples featured on the *Learning* section of the Processing website.[10] It is important to point out that, because Processing has become such an accessible tool and is a relatively easy to learn programming language, it is not uncommon that students arrive to this course with a fairly good understanding of the tool, if not already proficient with it.

Assignments and pedagogical support materials

The first weeks of the course are dedicated to learning the fundamental building blocks of the programming language (see appendix CART 210 – class schedule). Through in-class exercises and six bi-weekly assignments, most of which consisted of step-by-step problem-solving exercises, students explored and implemented the basic programming concepts. The assignment briefs were very detailed and provided examples for most problems students were asked to address. Some assignments (i.e. *Assignment 4. Interaction and animation II* in CART 210 – class schedule) proposed extra steps for students who already felt confident with the tools and were willing to take on greater challenges. As students assimilated the basic programming skills and grasped the enormous creative potential of this programming language, the exercises became increasingly open to creativity, and students quickly ventured into more advanced concepts of programming to create more dynamic, responsive interfaces. For example in exercise number six, the final project, students were given very general guidelines (i.e. the composition must react to user input, be implemented using object-oriented

[10] http://processing.org/learning/ retrieved June 5 2009

programming methodology – Processing, and involve some animation). Students worked in groups to create an interactive work, of which they decided the concept and content. Additionally, Richard asked them to create a website in which the work would be embedded and where they articulated the conceptual approach, including links to conceptual, visual and computational references and a detailed description of the role played by each member of the team. The final assignment was also evaluated on the aesthetics and information design of this web page.

Other assignments (i.e. *Assignment 1. Variables*) required that students also conduct individual research and comment on examples of the creative uses of the Processing language. Such exercises met the theoretical component of this course.

On week seven, invited lecturer Daniel Shiffman talked in class about his own practice in computational media. Shiffman teaches in the Interactive Telecommunications Program at NYU's Tisch School of the Arts and is author of the book *Learning Processing: A Beginner's Guide to Programming Images, Animation, and Interaction* (2008). He is also an active contributor to the Processing online community and several examples of his coding can be found in the *Learning* section of the Processing website. In class, Shiffman did an introductory lesson on "Arrays".

Richard selected three texts to be read and discussed in class; these readings pertained to the history of computing, interactive design and the aesthetics of generative coding. The reading that specially informed me on one important aspect of this course was *The Aesthetics of Generative Coding* (Cox *et al*, 2003) where Cox draws a parallel between writing poetry and the creative process of writing code. His thesis is that the

aesthetic value of both lies as much in its execution as in its written form. Like poetry Cox says, "to appreciate [code] we need to 'see' the code to fully grasp what it is we are experiencing and to build an understanding of the code's actions." (p.6)

Given the screen-based, networked nature of the content and exercises of this course, the course website was an essential pedagogical tool. All information pertaining to the course could be found in it, from the course outline, the schedule, handouts, readings and permanent links to instructional material on general programming, Processing tutorials, links to Processing coders' websites and blogs, and other useful resources. It also featured an *Assignments* section with the detailed requirements for each assignment under which were posted the students responses. The students' responses could also be accessed through their personal pages under the *Students* section. Also in the *Assignments* section was a link to the *Greatest Hits*: some of the students' responses highlighted by the instructor.

Interview with the instructor

Richard had promptly agreed to participate in my research when I first invited him, and he immediately gave me access to the course website when I requested documentation that would inform me on the contents and structure of CART 210. Not only did I find there all the information I hoped to have access to, but when browsing through the links of resources and tutorials available to students, I found myself downloading Processing and quickly 'hacking away' with it.

My own introduction to programming languages dated back to 2003, during my BA in Graphic Design. It had been limited to one unit in one course that consisted of a broad overview of (what were then) contemporary multimedia arts. The reference for that unit had been the book *Design by Numbers* (Maeda, 1999). This book introduces the programming system *Design by Numbers* (DBN) developed by John Maeda to engage designers and artists with the medium of programming, in order to develop their own digital tools as an alternative to the corporate software packages that a majority of us use in the graphic/visual arts. DBN soon proved to be limited, but it was fundamentally the predecessor of Processing. In 2001 Processing emerged; it was developed by Fry and Reas while both were Maeda's students at the MIT Media Lab.

So while collecting data to analyze CART 210 course and investigating Processing, I rediscovered many of the programming notions I had been briefly introduced to during my Graphic Design training and that I have been unconsciously using through the graphic applications I daily work with.

I met with Richard at the end of the course, as soon as students had deserted the Design and Computation Arts department after the hectic end of winter session. In his office, I set up the university's old tape recorder as Richard rolled on his chair from behind the desk, closer to the deep leather bench where I sat, by the window.

I was successful in addressing all topics I had planned to inquire about, (following the Interview guidelines in the Method chapter) and in resisting the temptation to elaborate on the creative potential and future directions of the Processing environment, a topic that greatly interests me as well. The conversation resulted in ideas, which I

analyzed according to the following themes: 1) Development of the conceptual framework, 2) Technical component, 3) Students skills development and finally, 4) Computer programming languages and artistic expression.

Theme 1: *The development of the course's conceptual framework*

My primary interest in personally meeting the instructors was to get first person accounts of the rationale behind the pedagogical program. So I first inquired about the general goals of CART 210. At the introductory level, Richard explained, his main goal is to convey the feeling that programming is a creative tool that is available to students and accessible:

> *My priority is to get them not to be afraid of programming (...) It's just making it so that they understand that these things are not scary things that only mathematicians or computer scientists or few artists can do. They are actually tools lots of people can have access to.* (Richard, Personal communication, April 20, 2009)

He added that the priority is not to teach aesthetics in computation, although that is also important and it is explored throughout the semester. So I went on to ask about how the two aspects were incorporated in his lessons. He answered:

> *What I like to do is that over the course of the year [the assignments] become less and less technical and more aesthetically based. So by the time we do the final ones the discussions are mainly creative critiques. "Why did you choose to do this project?", "why does it look this way? (...)*

The beginning of the year is mainly technical. The assignments are divided into specific exercises and since students are responding to the same problems, I have just a few people presenting each of the five or six problems, and those serve as a springboard

for others to ask questions about the problems that they encountered. When somebody does something interesting I post it in the briefs section in the website.

> *The last project is an open project. This year they had three weeks to do it and by then they already knew a lot of the technical so they had time to put some thought into the aesthetic dimension. At the end we spend almost no time talking about the technical stuff. I do in my written feedback to them, but not in class.* (Richard, Personal communication, April 20, 2009)

Theme 2: *The technical component*

Another topic equally relevant to my research study was the challenge of teaching rapidly evolving media. CART 210 is based on computer programming languages, a field that has evolved extremely fast in the last decades. Therefore I asked Richard, who has been teaching this subject since 2002, how in the context of this course he dealt with the constantly evolving tools.

> *When I first started I think I started teaching [programming] with Flash and gave up on that because you spend too much time teaching Flash, and not enough teaching programming. And then we moved on to something called Design By Numbers, which was created by John Maeda. So this was the thing that preceded Processing, right? (...) Processing is by far the best thing. And the nice thing about Processing is that it's sort of extending itself quite nicely. I don't feel like it's obsoleting itself. It's doing what a good robust programming language does, which is that it's open enough so that as things change, people come up with different functionalities, like people create libraries and these become third party libraries that others can use.* (Richard, Personal communication, April 20, 2009)

Processing has reached a tremendous potential for creative explorations that manifest beyond the screen and merges with other media. Nevertheless, it is hard to predict what

will follow in artists' quest for innovative algorithms. Richard asks himself the question: "*What am I going to teach in two years from now? Am I still going to be doing Processing? Or maybe should I be doing something else? And I'm not really sure what the answer to that is yet.*" Ahead in our conversation he added, "*You have to keep your eyes open and pay attention to what other people are doing and what other design artists are doing, see what's emerging.*"

Theme 3: *Students' skills development*

By the time I met with Richard I had completed the observation I conducted in CART 200 during which I noticed that in that course, which was also an introductory level course students arrived with very disparate levels of technical skills. Even though the course outline of CART 210 made clear that the program was designed to introduce students never having programmed to the basic concepts of programming, I asked about the technical level of students arriving into this course. Richard's answer unfolded into a discussion of how the technical proficiency students bring when they first come to this course has been evolving in the last years.

> *There are students arriving in to this class who have been "hacking away" in Flash or something like that, and then there are students who have never done any programming... so I'm trying to find a common gap. And every year there is probably two or three students who are in the Specialization [program] and already have fairly advanced computer skills, who I just exempt from this course. I tell them to go to the advanced course because they know all the basic concepts already.*
>
> *I would say that over the time in the five or six years that I have been teaching it, that gap has flattened down. There used to be people [coming into this course] who just had no clue of what I was talking about and then there might be a couple of people who already had been doing this. Now there's nobody who doesn't know*

what I'm talking about and there's fewer people who have not done some kind of coding, even if it's html. (...) There's a huge difference to when I started teaching in 2002. (Richard, Personal communication, April 20, 2009)

So, prior to arriving into this course, many students had already been exploring some kind of programming. Not surprisingly, I commented, given that programming environments like Processing, are so widely available and easy to explore using the online resources. I asked if throughout the semester students took the initiative to go beyond what is presented to them in class and used the online resources, for example external libraries, to build more ambitious projects.

Students definitely go out there and find libraries and start using them. Probably at least two or three weeks before I even introduce it in the class and say this is how you load an external library, about half the class has gone out and found libraries they wanted to use. Because they just found something that was cool or they were trying to figure out and so they have been asking questions online and somebody said "use this library here", so they are definitely proactive about going out and finding that stuff.

(...) *And that's a change as well. I feel there is a growing awareness that the Internet is this huge resource and that we are going to use it. For the students that are coming in right now it's the most bloody obvious thing to say, right? Two years ago it was obvious to some but not to others. Four years ago not at all, so they would just tend to stay within this little world we created and not go out and explore. Now they are constantly looking for stuff...* (Richard, Personal communication, April 20, 2009)

Theme 4: *Computer programming languages and artistic expression*

My final question related exclusively to this course: computer programming being such a new medium for artistic expression, I asked Richard how he perceived the use of

this language, which had traditionally been reserved for mathematicians and computer scientists, in the field of the arts. Richard sees this as a clear articulation of something that has always been present in art history;

> *All artists who are truly invested in their craft are intensively invested in the minutiae of the technique of their craft, whether it's painters in relation to brushes they use, different kinds of canvases, stretching and different pigments or different kinds of paint... which they can talk about forever, right? Or sculptors talking about different materials... Anybody that is really invested in their artistic craft, they are all geeks in some way. And this is just the same thing right? These artists or these designers are "geeking out" about something that has traditionally been reserved for engineers, right?*

Because programming is so new as a creative tool, Richard explained,

> *It seems like this thing is coming over from the computer science world and we are sort of training artists into these logical, mathematical machines. (...) And because it's new we have to use a lot of the language that comes from engineering, because we haven't developed the language within our own domain to talk about it."* (...) *The fact that this is all happening right now is what makes it so fascinating. But in fact, if we think about the fundamentals of it, it's no different from a process that has happened before, in other artistic disciplines.* " (Richard, Personal communication, April 20, 2009)

In the future the separation of the computation arts into an isolated artistic discipline in and of itself will become redundant. "*In ten years,* Richard concluded *it's either you use a computer as part of your tool set or you don't. A lot of us already do, and there is nothing special about that (...) because there can be different levels of engagement with the tool, within the design and art spectrum."*

Not all artists need to be proficient with generative programming, the core of computing. Many choose to use the computer as a tool or supplementary device, and limit their use to the mainstream software packages, even if these are often limited when it comes to matching artistic spontaneity and expectations.

Students in the Specialization program have the opportunity to touch on a variety of media, as I have made clear in describing CART 200 and 210. Through the course of their studies in this program, students concentrate on the media of their choice. Those who wish to improve their programming skills and further investigate programming languages as a tool for creative expression can enroll in the following year in an advanced level of CART 210.

The course I describe next is a course offered in the final year of this program. As the description will show, it allowed me a broad overview of where students' investigation of computational media culminates in this program, both technically and conceptually.

CART 400

Through the two introductory level courses I investigated, CART 200 and CART 210, I sought to understand the teaching strategies used to train artists at the early stages of their discovery of digital technologies and the computation medium. The third course I explored is also a required course, but it is offered in the final semester of the Specialization in Computation Arts program. By then, students should have amassed a broad vocabulary of technological processes and conceptual approaches, so they can now concentrate on the particular salient aspects that are relevant to their practice.

CART 400 differs from the previous described courses in that it does not allot a significant amount of time to the technical component of the media tools students choose to work with. Rather, it is designed to engage students in the processes of articulating their concept development and conduct research to sustain their individual artistic practices. Because the emphasis is on the development of research and analytical skills, CART 400 completes my study as it illustrates yet another set of teaching strategies and objectives that students are expected to meet in the course of their studies in this program.

As in the previous two courses, I began collecting information on CART 400 from the course outline, which Louise[11] - the instructor, promptly gave me access to when I presented her the objectives of this study. This allowed me to become familiar with the structure of the course as well as the themes, objectives and assignments. The outline also offered several pedagogical resources and the readings recommended to the students throughout the semester. At the end of the semester Louise invited me to attend the students' final projects presentations, which was an opportunity to understand the

[11] Pseudonym

research invested in the concept development and the overall work process of students' projects. This session also gave me insight on the technical component of the course and on the tools with which students chose to work.

Conceptual framework

CART 400 is a studio-based course in which students respond in creative ways to how technoscience is shaping the everyday life and artistic approaches. Through this course students are not only introduced to contemporary design and art practices, but to a wider range of creative endeavors across different disciplines that converge in the use and development of new technologies. Drawing on theoretical studies that touch on numerous research domains, the course "explores a variety of social, cultural, political and ethical issues that arise in the face of emergent science and technology" (Course outline for CART 400, Winter 2009). These issues become the premises to which students respond critically by imagining alternatives to the contemporary paradigm.

The objectives are explained in the course outline as follows:

> In this course [students] can expect to 1) assess the social and cultural relevance of artistic practice; 2) develop and apply critical art research skills; 3) explore creative approaches to making science and technology public; and 3) produce print, web and/or 3D artifacts suitable for inclusion in your portfolio (Course outline for CART 400, Winter 2009)

Students are expected to document the creative process and clearly articulate their concept development during group discussions and presentations. As most students who take this course are close to graduating from this program, this course also functions as a platform for students to develop work that will enrich their portfolio.

Technical component

In the course of their studies students experiment with multiple digital media as a way of broadening the spectrum of tools and approaches they can choose from in their own artistic endeavor. In CART 400, there is no defined set of tools or techniques students must employ. They are encouraged to embrace and build on all the technical skills they have developed in the program. For technical concerns and troubleshooting, they continue to take advantage of the resources provided by the Computation Arts department such as the Sensor Lab, the Design Lab, the Computation Lab and the CDA.

During the students' presentations, I noticed many made use of the media tools introduced in CART 200 and 210 such as video and sound capture devices and editing software and programmed interactive applications. At least half the group employed multiple technologies in the execution of their projects. It is equally important to mention that the outcomes of the assignments went beyond screen-based digital work. Some projects were rendered into 3D objects, illustration or printed work. Hence CART 400 differs from CART 200 and 210 in that at this level, students choose the medium that best fits their ideas, as opposed to, for example, the first exercises of CART 200, where the medium was pre-defined and the concept was to be explored by attending to the intrinsic qualities of that medium.

Assignments and pedagogical support materials

Most lessons are divided into a theoretical component given in a small lecture and a studio component. Between lessons, students are assigned recommended readings to be discussed in class. These readings address issues emerging from the present technological

and scientific advances that shape our collective and individual ways of life and consequently, also shape our view of the world and our ways of creating. Topics range from reproductive technologies, genetically modified food and organisms to the pervasive use of technologies in urban public spaces. (see Appendix III – CART 400 Class Schedule)

Assignment 1: *The year is 2059...*

During the first four weeks, students are required to read Scott Westerfeld's *Uglies* (2005), a thought-provoking science-fiction book about a world in which teenagers undergo an operation at the age of sixteen that makes everyone beautiful. Through this fiction, Westerfeld raises questions about the meaning of beauty and futuristic technologies and he is critical of public policies and propaganda. *Uglies* is an accessible reading and an inspiration for the first of two major assignments that constitute the studio component of this course.

In the first assignment students are asked to create a fictional graphical narrative that "critically and creatively imagines roles that science and technology will play in everyday life fifty years from now" (Course outline for CART 400, Winter 2009). The narrative must employ original text and images (using drawings, photographs or collage) and can be presented in printed or digital format. Students are asked to thoroughly document their research and the progress of their work as the presentation of the narrative is to be accompanied by a visual presentation of the concept development and work process. As explained on the assignment brief, " by imagining possible alternatives for the future, students are also encouraged to take responsibility for science, technology and social

change – and to creatively inspire others to do the same". Louise invited two graduate students as guest critics for the final presentations of this assignment.

Following *Uglies* and the first assignment, further readings were recommended to the students. The texts I discuss next testify to the diversity of subjects and research contexts students come across throughout the semester.

Like Westerfeld, Cory Doctorow's book *Little brother* (2008) also takes place in the future and depicts a scenario that emphasizes present concerns such as technological enhanced security, surveillance, the rights of the individual and issues of privacy. Doctorow is also one of the voices in the film *Rip: a remix manifesto* (Maddin, 2008).

I found particularly engaging the recommended readings *The Molecular Invasion* (Critical Art Ensemble, 2002) and *The Internet of Things* (Von Kranenburg, 2005). In *The Molecular Invasion* the Critical Art Ensemble (CAE) proposes ideological responses to the control of corporate superpowers and political interests over the biotechnological developments in such essential research fields as medicine or agriculture. The CAE proposes a practical response by means of "contestational biology" (p.10) defined as the creative practices that appropriate knowledge systems, products and processes of biotechnology to develop intervention work that will start a debate, raise awareness on these issues and ultimately disrupt profits from the corporate exploration of common knowledge and resources.

In 2005, I took part in a symposium on New Media Arts[12] in which Rob von Kranenburg presented his research study. Having just graduated in a Design program –

[12] This Symposium was organized by the Asia-Europe Foundation and took place in Bandung, Indonesia in July 2005. It regrouped ten students from different European countries with ten students from Asian

thus being roughly at the same level of CART 400 students this semester, I felt extremely inspired by the ideas put forward in his lecture and the discussion that ensued. Kranenburg's study could come straight out of one of Westerfeld or Doctorow's fictional accounts, but it doesn't. The study takes a critical look at very real but invisible technology of Radio Frequency Identification (RFID) tags that nowadays tag almost every kind of consumer item. These tags can be traced by wireless networks thus creating a network of objects or *The Internet of Things*, where information is stored and can be retrieved. Kranenburg questions the establishment of such invisible systems that clearly bear surveillance purposes and are being used with little or no public consent.

Most readings Louise recommends can be retrieved online from websites of engaged communities or collectives who freely offer their ideas to keep the dialogue open. Others are from e-Journals accessible to students through the University library. This expands students' repertoire of sources, where they can find activists, bloggers, scholars and artists whose ideas and practices can inform their own work. All these resources can be accessed through the course website, where the information pertaining to the course, including an archive of the lectures and discussions from past lessons can be retrieved.

Assignment 2: *Imagined Futures*

The second assignment is inspired of Anthony Dunne's (2008) *Design for Debate*. Dunne is a professor and head of the Department of Design Interactions at the Royal College of Art in London. In his program, students investigate emerging biotech and

countries and several educators from both continents to discuss New Media Art theory and practices and to visit artists' initiative spaces.

other technologies based on which they imagine situations and create objects or experiences that represent their concerns over the introduction of such technologies in our lives. Its main objective is to give art and design a new role, one that moves away from the compulsive production of desirable objects, to one closer to the task of conceiving scenarios that inspire, raise awareness and provoke debate about our common future. (Dunne, 2008)

According to the Assignment 2 brief, the purpose of the project is "to critically explore how computational arts can engage public concerns around emergent science and technology, and effectively reimagine our shared futures" (In course outline for CART 400, Winter 2009). The assignment starts with preliminary research to establish a theme and develop a concept that will guide the entire work process. Students work individually to select one research article on a technoscientific issue of their interest, which they are asked to summarize and analyze. This article must inform students about the social, political or ethical concerns of emerging technoscientific research that they will explore in the final project. In the next step, Louise asks them to investigate art and design projects that touch on the concepts they are investigating.

As in the first assignment, the final work must be accompanied by a written introduction and by a visual presentation of the complete work process. The final presentation class took the form of an exhibition: the pieces were displayed and students could learn about the different issues by interacting with their peers' works.

Observation of students' presentation

I was invited to this final class where I had the opportunity to observe, and in some cases interact with the students' projects myself. As it is not the purpose of this study to assess the outcomes of the curricula and the success of the teaching strategies employed, I will not make detailed descriptions of the work presented. Nevertheless, students' presentations completed my understanding of this course by providing further insight into the concepts and media students explored in the assignments. As I also observed in CART 200, the way students articulate their work processes informs me about the visual and verbal literacy skills they develop through the pedagogical support materials presented to them and the research processes they conduct on their own.

Students were given great latitude with their final projects. As a result, I was impressed with the level of the research that had been conducted and the variety of media students chose to employ. For this project, most students had to investigate sources outside the art and media theory. Their projects demonstrated that students ventured into diverse fields of study such as biotechnology research to enhance the physical and intellectual capacities of the body, the repercussions of genetic manipulation of food on the human faculties of thought and knowledge, social studies touching on issues of gender and the history of clothing, and critical commentaries on the present phenomena of broadcasting of individual lives and states of mind using networked communication technologies, and many others. The research behind the projects revolved around real techno-scientific and social studies, so the imaginary scenarios students constructed based on their findings were creative and generated engaging, sometimes credible experiences. The choice of media was no less diversified: several students chose to create

interactive experiences that could be accessed online. There were also video-performance, illustration and printed media. Some students constructed physical objects.

This course highlights another important component in the training of artists who explore digital and networked media and employ new technologies in their artistic practices. It emphasizes the development of research and critical skills, and the ability to find in different fields of study topics and concepts that inform their creative endeavors. The design of course CART 400 offers a cohesive structure to an entire group, yet remains open to accommodate students' different topics of interest, supporting each individual in her/his research process and choice of media.

CHAPTER 5

DISCUSSION OF FINDINGS

The courses I investigated focus on different themes and different media. Two of the courses are introductory level courses (CART 200 and 210) while one (CART 400) is offered in the final year. Nevertheless, this chapter reveals that common pedagogic objectives and teaching strategies can be identified across the three studio courses, with variation in emphasis. Combined, the three courses offer an overview of how this program prepares future artists who work with digital media. As I analyzed the course descriptions I drew connections with key ideas from literature I reviewed throughout the research process. Some of these authors helped me establish the guidelines and the concepts to look for when analyzing the three courses. Others are authors I discovered in the course of the study while looking to confirm ideas and better understand concepts that emerged from the case study data.

To reiterate the goal of my study, I did not set out to investigate the skills students acquire in these three courses but rather to uncover the pedagogical goals of three computation arts studio courses and understand the challenges that arise and strategies implemented by the teachers as they try to meet these goals. At the early stages of this study I realized that to talk of pedagogical goals is necessarily to talk about intended learning outcomes and acquired skills. Hence, in this chapter I sometimes describe observed outcomes only to illustrate the objectives of the course, with no intention of assessment.

This chapter is divided into five sections corresponding to the codes that emerged when I juxtaposed the data collected with literature that informed this study. They are:

1) Computation arts: drawing on artistic traditions and attending to emerging paradigms

2) Pedagogical objectives: Hard skills, Soft skills and Meta skills

3) Overview of the teaching challenges and strategies to meet the pedagogical objectives:

3.1) Course design

3.2) Pedagogical support materials

3.3) Teacher's commitment to learning

3.4) Fostering proficiency in multiple media

3.5) The course website as an extension of the classroom

4) Teaching responsibility and collaboration

5) The convergence of disciplines

1) *Computation arts: drawing on artistic traditions and attending to emerging paradigms*

I will begin with a discussion about how computation and digital arts simultaneously draw on older media artistic traditions, while also defining new artistic paradigms with qualities that are intrinsic to digital media. This view can be identified across all the three courses. It is an important starting point in that it sets up the general framework in which teachers are designing curricula (research question 1), and it addresses issues of teaching technology and artistic inquiry in today's context of rapidly evolving technology and theory (research question 2). At the same time, this starting point allows me to begin with

a small argument for the legitimacy of computation media in contemporary artistic practices. While this might seem obvious to some, I still encounter pre-computer educators who believe that the point-and-click ease of computers does not afford art works produced with these media the same value as works produced with traditional media (which are seen to require meticulously acquired refined motor skills).

This study showed that in the content and structure of the curricula there can be identified aspects of computation arts that build on artistic traditions defined by previous movements and analog media. However, there can also be identified aspects that were introduced with the advent of the computer and networked communication technologies. Consequently, educators in computation and digital art courses are simultaneously building on a tradition, addressing the present paradigms and forecasting future developments.

Literature I reviewed brought to my attention the idea that the computer is often explored as a creative medium that simulates forms of expression and aesthetic qualities previously defined by old media. A number of media theorists have argued that digital art further develops ideas that first emerged within art movements in the 1960s and the 1970s that focused on conceptual approaches, events and audience participation. These movements introduced the idea of the artwork as a temporal performance rather than a fixed object, and the idea of artwork as an open system. For example, the events performed by artists from the Fluxus group with the participation of the audience, in many ways anticipated notions of interactivity and the event-based nature of computer-generated artworks. The "controlled randomness" of some of their performances is

comparable to the random (yet limited by a set of rules) access to media elements and to the infinite ways of processing and assembling media that are characteristics of computation functions. (Paul, 2008) This is explored, for example, by artist Brian Eno whose generative music and video work I outlined in CART 200 course description.

Lev Manovich (1999) traces the influence of traditional media on digital creative applications to the artistic movements from the turn of the previous century. He argues that the avant-garde movements defined the set of visual and spatial languages that are still employed today in computer software: "For example, the avant-garde strategy of collage reemerged as a *cut and paste* command, the most basic operation one can perform on any computer data" (p.3) or the many tools and filters one can find in image editing software like Adobe Photoshop®, that are clearly inspired from qualities of analog media like the "film grain", "halftone", "graphic pen" and "pointillism".

In CART 200 I observed students' first experiments in interactive performances and in time-based, networked (open) art. To illustrate these concepts Mark included artists' works such as William S. Burroughs "cut-ups" (1950s to 1960s). Mark also showed contemporary works like the movie *My Winnipeg* (Maddin, 2008) that combines traditional narrative styles that have been long cultivated in other media such as story telling, documentaries and fiction. During students' presentations I observed how they used the computer to achieve effects characteristic of traditional media. For example in the video works of the first assignments, one student manipulated the image to enhance the grain and hues of the image to simulate Super8 film qualities. Another student edited the video frame-rate to simulate stop-motion animation techniques. This, as Mark often

pointed out in class, conveys the view that the computation arts do not develop in a vacuum but are profoundly linked to the history of art and media.

However, the artistic practices the groups discuss in class and the work they produce also have qualities that are specific to digital media and computation. Artists have been drawing on this medium's encyclopedic, spatial, procedural and participatory properties (Murray, 2003) since the very early stages of digital technologies. From their exploration emerged artistic practices that clearly changed the final products of art and, perhaps more importantly, changed the creative processes. In his introduction to *The New Media Reader* Lev Manovich (2003) argues that media producers (including artists) are exploring new types of work processes that draw on the accumulation of vast amounts of media records that the digital format allows, the networked real-time communication technologies and the distance control of technological devices. These processes are changing the inherent qualities of the work itself. CART 200 final assignment *Shred* was precisely concerned with exploring such processes, like accessing, exchanging, transforming and combining digital media, from which students generated new virtual as well as physical interactive performances. Students' works resulting from this course as well as artworks discussed in class – such as Christian Marclay's works presented in *Replay*, Brett Gaylor's *Rip: a Remix Manifesto* (2008) – are examples of such new processes of media production. In CART 210 students also explored qualities that are intrinsic to computation when learning the programming languages needed to develop generative graphic interfaces and applications that are procedural and participatory.

Although the computer is at the center of these creative approaches, in the three courses I examined, the emphasis in the courses' framework is away from the machine itself. The work processes and aesthetic qualities achieved using the computer often evoke other media and the final product is not always screen-based. Hence, the computer as well as the other technological devices used, becomes almost invisible. As I will discuss in detail in the following section, the descriptions from the previous chapter show that the three courses are designed around the articulation of creative and critical skills, with technical considerations and interdisciplinary knowledge necessary to become familiar with the contemporary new media art production processes.

2) *Pedagogical objectives: Hard skills, Soft skills and Meta skills*

The three courses I investigated are studio-based courses. Part of each course was dedicated to acquiring technological skills and hands-on experimentation with the tools, but none of these courses, and to my knowledge, no course of the Specialization in Computation Arts program, addresses exclusively the technical competencies to manipulate the technologies. Aside from the first weeks of CART 210 during which students were guided step-by-step through the fundamental building blocks of a programming language, the technical aspects were usually discussed in the labs, attending to the specific needs of students as they worked on their assigned projects. Students were generally expected to devote a significant amount of their own time to develop the necessary technical skills to create works that showed an efficient use of the chosen or suggested tools.

In the three courses, emphasis was placed on other dimensions of art learning and making, such as understanding the historical context of media and works of art, analyzing and formulating responses to artistic practices, recognizing different forms of narrative, and aesthetic choices. In CART 200 and 400 the interest was also on debating issues of the cultural and social environments. I will refer to these dimensions of the studio curricula as the theoretical component, which I analyze in detail in the next section. This component aims at fostering students' critical skills and inquiry to analyze past and present modes of production and artistic practices, including their peers' and their own.

The emphasis on the theoretical component is immediately evident in the objectives stated in the course outlines. For example, in CART 200, students are to "become aware of various modes of cultural production". In CART 210 they will "study the history of computing in the context of new media and technology" and "become aware of computational approaches to multimedia projects". All objectives outlined in CART 400 course syllabus highlight theory-based aspects of the studio learning experience.

Many authors discussing curriculum development look at the pedagogic objectives of technology-based studio courses in terms of the skills that instructors intend to foster through the learning tasks. I identified three general sets of skills: Hard Skills and Soft Skills (De la Harpe *et al*, 2009) and Meta-Skills (Wilson, 2008, Ascott, 2008).

Hard skills refer to readily available knowledge and mechanical processes. These are generally understood as the basic skills students develop. In the three courses of this study, hard skills include the use of technology, manipulating the hardware and software, combining and transferring media between devices. It also encompasses the knowledge

of the history of art and media – understanding the past and contemporary paradigms of artistic creation and how they relate to the succession of technological advancements in time. In learning media history, students also come to understand how traditional media have influenced and continue to influence digital media and why the new technologies (including the computer, its peripheral devices, software applications and navigation systems) are designed or programmed in ways that support and exclude certain kinds of representation and narrative. Only when students understand these pre-established frameworks they can consciously break out of them.

It is also through the theory of the media that students build the terminology specific to their discipline of study, which they will employ to better present their work and to critique other's work and ideas during group discussions. This aspect was essential in CART 400 for example, in which students invested a significant part of the work process researching the technoscientific field that informed their projects. They investigated theory on specific topics and the practice of other artists addressing the same ideas. Students were also asked to clearly articulate their concept development and work process through written or oral presentations. I was able to observe during the final presentations that students had acquired very specific terminology from the research field they investigated.

Computation art students must take a year-long six-credit course that is mandatory for every student enrolled in the Fine Arts. In this course students from a broad range of artistic disciplines including painting, sculpture and photography share ideas with each other. This course contributes to expanding their references. I observed in CART 200 presentations that students establish connections and employ terminology from the other

disciplines to refer to their own compositions and to their aesthetic choices using the computer.

Soft Skills pertain to non-technical competencies like association of concepts, well-articulated critical thought and being able to demonstrate sustainable work processes for each learning task. Instructors consistently presented examples of theory and artistic practices to guide students into understanding the course topics. After analyzing and discussing these references, students were asked to consider how they could inform their individual creative processes. For example, at the end of the semester dedicated to exploring the remix and recombinant media approaches supported by lectures and field trips, the final assignment *Shred* lead students to reflect upon what it means to subject their own work to be deconstructed and remixed with other media for a completely new purpose.

Thomas Rickert and Michael Salvo (2006) write about the development, proliferation and dissemination of new media that are unfolding new ways of media production and consumption. They argue that such processes must be brought into pedagogical practices, because they define the contemporary paradigm of the re/mix/digital culture. Although their article refers specifically to the kind of production that has been cultivated in music and sound media, their ideas resonate with many forms of contemporary artistic expression when they say that these new ways of production "offer vocabularies, models, and practices for new media writing and culture generations beyond the tradition of text-based composition or the singular work of art." (p.296)

CART 200 is an example of teacher awareness of such new models and the need to train students in developing the soft skills to work within the contemporary creative paradigm.

According to Wilson (2008) and Ascott (2008) there is yet another set of skills that must be cultivated in art education: **Meta skills**. They believe that in face of the fast pace of change it is impossible to predict what skills will still be relevant a few years ahead. Since the digital age has demonstrated that today's technical skills rapidly become obsolete, they argue that the best way to prepare students is by teaching "inquiry and analytical skills" (Wilson, 2008). Such skills will serve to cultivate life-long creative endeavors. Ascott (2008) identifies five such meta skills in the article *Pixels and Particles: The Path to Syncretism* (2008). They are concept development skills, the ability to take part in collaborative processes, seeding structures, making metaphors and constructing identities. (p.50) While reading Wilson and Ascott I revisited the course descriptions to find out whether meta skills were part of the teachers' agenda.

The research processes and concept development that were emphasized in CART 400 are skills that will transcend the course learning tasks. Students will transfer the ability to work collaboratively and to develop conceptual approaches to their work in future projects and to their future professional life. More evidence of these skills can be found in the collaborative work processes in CART 210 final assignment and CART 200 assignments *Dialogues* or *Shred* which, as Mark mentioned in the interview, "relates to a lot of media development where you just have to collaborate in order to work on large-scale projects". In order to work collaboratively, students do not need to become experts of every step of the process but they do need to develop a certain level of competency in

several areas that will allow them to "converse with someone who might have a greater knowledge and to be able to explain a concept appropriately". Across the three courses, students were exposed to different artistic approaches and experimented with various media as a way to help them develop personalized creative approaches and construct their own artistic identity.

When formulating the objectives for their courses, the teachers face the challenge of articulating the teaching of technical skills, of history, theory and aesthetics, while also mentoring students in methods of inquiry, concept development and critique. Next, I analyze teaching strategies the instructors develop and implement to meet the pedagogical goals.

3) *Overview of the teaching challenges and strategies to meet the pedagogical objectives*

In a first analysis of the teaching strategies adopted by the three instructors it appears that the format of these courses, including the way assignments and pedagogical support materials are presented, corresponds to an infrastructure that does not differ much from the way more traditional Fine Arts disciplines have generally been taught for decades (Wilson, 2008). It immediately came to my attention that each studio course was comprised of a theoretical and a studio component. Students are exposed to past and contemporary artistic practices supported by presentations and selected readings which they are asked to critically analyze. They are asked to articulate their work processes during class discussion and they are assigned individual as well as collaborative projects. These correspond to general teaching strategies adopted in art courses in which students

are trained to become primarily producers of meaning while also acquiring technological knowledge. Wilson (2008) calls this a "theory-based model". This view holds that although learning in art and design ultimately aims at making art, any contemporary art practice is circumscribed by the quality of the discourse used to reflect upon and articulate the work. The quality of the discourse cannot improve without understanding the history and theory of the field. The study conducted by De la Harpe *et al* (2009) shows that this is a fairly traditional approach in studio-based courses as it has been cultivated as an art education model for several decades. It arose as art criticism within a general curriculum reform that occurred in the late 1950s and the 1960s in the United States, promising to bring about better understanding and appreciation of art. Since then, the instructional methods for art criticism evolved from a form of discourse that resembled recitation into what George Geahigan (2000) calls a form of "disciplined inquiry" (p.101). This inquiry, he argues, is to be carried out through three types of instructional activities (teaching strategies) that I easily recognized in the three courses described in my case study: "personal response to works of art, students' research, and concept and skill development." (p.102) The forms of inquiry proposed by Geahigan are based on the premise that students cannot understand or judge an art work through simple observation and exposure, rather they need to develop methods of inquiry that will give them access to background information that in turn will become tacit knowledge for their own art making processes.

Under the wide umbrella of this theoretical model for art education, I felt I needed to take a closer look at the individual instructional methods of the three participants to

uncover teaching strategies that address specifically the needs of these computation arts courses. The teaching strategies that I discuss next include course design, pedagogical support materials and assignments. I believe they are evidence of the emergence of new ways of teaching, mostly responding to the rapidly developing field of digital media, to the computer networking phenomenon, the multiplying sources of knowledge and information exchange available to the academic community.

3.1) *Course design*

Mark and Louise already have a few years of teaching experience but they were both teaching CART 200 and 400 for the first time at the time I studied their courses. Mark mentioned in the interview that he received course outlines from previous teachers and noticed how each teacher had approached the theme of the course very differently. Likewise, Mark as well as Louise redesigned the courses according to their own interests and expertise, and developed their own strategies to meet the general objectives of the program. Exploring the remix as an emerging cultural model of production, Mark started by imagining learning tasks and topics he would like to investigate as a learner. Louise's course delved into social, cultural, political and ethical issues arising from emergent science and technology, and asked students to research and respond critically to these issues in their creative work. Richard, on another hand, has been teaching languages of programming since 2002. Nevertheless, he explains in his interview how he has continually adapted and redesigned the course to keep up with the evolution of the programming environments and how he must remain attentive to emerging ones.

The first strategy that came to my attention from analyzing the three course outlines was the sequential relationship between the consecutive units and assignments. Instead of dividing the course into isolated units that each address specific topics through problem-solving exercises, teachers opted to gradually introduce new themes as the semester unfolded. These themes were added to all the theoretical and technical considerations explored up to that point. The previous focus topics were carried on to the new assignments and recalled during class discussion (as I observed in CART 200). This sequential structure could be found in CART 400 but was most evident in CART 200 and 210 because these two courses were segmented into weekly topics and several assignments.

In his interview, Mark explained the reasoning behind the CART 200 course design: the units build incrementally and at the end, students come "full circle" to the remix and recombinant media thematic thread with a final assignment (*Shred*) that agglomerates all the concepts developed and all the work produced during the semester. The same can be said about the structure of CART 210 where Richard gradually incorporates into the assignments the fundamental building blocks of the programming language. As students become familiar with the basic technical operations of coding and generate their first interactive works, the assignments become increasingly open to creativity and are discussed in terms of their aesthetic qualities.

3.2) *Pedagogical support materials*

The theory-based model translates into a significant part of the course time being allotted to presentations, group discussion about artistic practices and theory, research

assignments and critiques. Therefore, an important part of the teaching strategies rely on the pedagogical support materials that the teachers gradually introduce in the course. This came through most in CART 200 and 400, but was nonetheless evident in CART 210.

The instructors brought to class pertinent, up-to-date theory and examples to support fruitful discussion, and directed students to sources of information where they could further investigate their individual interests. The pedagogical support materials teachers used included visual presentations, texts and audio-visual media. Additionally, teachers invited guest speakers and referred students to lectures, events and exhibitions that related to the topics of the course.

Mark and Louise gathered for their courses an impressive amount of pedagogical materials that they referred to during lectures and class discussions. Most of the references Mark presented were accessed online, through artists' websites or media sharing websites. In CART 210 – the course that devoted the most time to the technical considerations of the medium – students were also assigned readings about the history of computing, interactive design and the aesthetics of generative coding. The suggested reading "*The Aesthetics of Generative Coding*" (Cox *et al*, 2003) raised important questions about the aesthetic value of generative code. As happens in poetry, the aesthetic value is often relegated to the resulting visual/interactive experience, and omitted from the process of writing the code and executing it. Cox argues that equal aesthetic value must be recognized in the writing process as well as in the execution of the code. Louise used texts available online from the authors' blogs like Cory Doctorow's[13] or collective

[13] http://craphound.com/ retrieved June 20, 2009

blogs like the Institute of Network Cultures[14]. Other materials were available on the universities' online library and publication databases. In addition to the pedagogic support materials recommended by the instructor, students were asked to conduct their own research and find materials that met their individual interests. Students invested a significant amount of time in researching the theoretical background for their projects by analyzing writings and artists' work relevant to the issues they chose to investigate. This brought into class a great variety of references.

Bill Seaman, Professor and Head of Department of Digital Media at the Rhode Island School of Design, developed a similar teaching strategy which he describes as a "pluralistic support methodology" (2008, p.261). Seaman's method is comparable to Louise's in that they both define a set of essential texts that are complemented by students' own choice of readings to contextualize their work. This, Seaman argues, is a way to counter any notion of a "canon" for digital media. He goes on to explain that this is a way to have students develop a "unique, articulate sphere of conceptual underpinnings" (p.262) that they refer to during group discussions to articulate their work and ideas. In making room for each students' input, "the work does not spiral inward, being informed by a few central theorists, but expands outward in an articulate manner, broadening the scope of creative artistic and/or design-related thought and production". (p.262)

In addition to materials presented in class, the instructors expand students' sources of references by inviting experts into the class or proposing extracurricular activities to the

[14] http://networkcultures.org/wpmu/portal/ retrieved June 20, 2009

students. Mark incorporated several events taking place in Montreal during that semester, all connected with the theme of the course: Christian Marclay's exhibition *Replay* was a scheduled field trip whereas Rafael Lozano-Hemmer's lecture and the screening of the movie *Rip: a remix manifesto* (Gaylor, 2008) were extracurricular activities that were suggested to the students because they strongly related to the assignments in progress. Richard invited Daniel Shiffman, who talked about his practice in code developing using Processing and Louise invited guest critics to students' presentations of their first assignment.

3.3) *Teachers' commitment to learning*

When teaching within the theory-based model, the teachers must also be researchers and theorists. They master the course topics and orchestrate the flow of their course, the contents and strategies to meet the pedagogical goals. However, there is clearly a changing dynamic in what used to be a one-sided flow of information from teacher to learner, which is largely due to the widespread availability of sources of information and pedagogical materials. It is also related to the rapidly evolving technologies and the changing nature of computation and digital art disciplines, such as the three I have investigated.

The three course descriptions demonstrated how students often arrive with self-acquired technical skills and bring their own set of references – the World Wide Web being unquestionably a major source. I observed in CART 200, particularly in the presentations of the final assignment *Shred*, students' ease in exploring and combining different media, some of which they were experimenting with for the first time. In CART 400, given the variety of topics the students investigate, the course framework (and the

teacher's interests) must remain flexible to expand according to what each student finds in their individual research.

In our discussion about CART 210, Richard pointed that students are autonomous in rapidly finding information, and are proactive in exploring the online communities and online tutorials to quickly achieve interesting results in their assignments. He explained that this is a major change from when he first started teaching programming languages. He states:

> There is a growing awareness that the Internet is this huge resource and that [students] are going to use it (...) For the students that are coming in right now it's the most bloody obvious thing to say, right? Two years ago it was obvious to some but not to others. Four years ago not at all, so [students] would just tend to stay within this little world [teachers] created and not go out and explore. Now they are constantly looking for stuff...

Several authors discuss how the pedagogical resources available to students are changing the role of the teacher in the classroom. The teacher no longer has the highest expertise, nor is he/she assumed to have mastery of all subjects. But the teacher is required to conduct ongoing research and continually update his/her own skills. Lucia Leão (2008), professor of Art and Technology at the São Paulo Catholic University in Brazil writes about the tasks that have accompanied her experience as a teacher in this field. Leão explained that the departure point for teaching in technology-based arts is the necessity to have a tireless research spirit.

> Dealing with new technologies is a constant exercise of discovery. This task is closely related to consciousness of the fact that teachers, like any other human being, are neither fully accomplished nor definitive. Therefore, we must abandon the idea of an inexorable content plan and think about the pedagogical experience as work-in-

> progress. (...) Even if we have exceptional knowledge or experience in a field of endeavor, dealing with cyberspaces and cyber enthusiastic people it is a great lesson of humility for the teacher. (...) Conversation and networking are absolutely essential skills to teach and learn digital domains. There is no escaping the fact that recycling and updating are essential. (2008, p.293)

Leslie Perry (2005) suggests that teachers regard each lesson as an occasion for self-education. He encourages practitioners to seek outside help when developing lessons by inviting artists, organizing field trips to specific events, shows or museum visits that will not only instigate critical reviews during in-class discussion but also "may result in refreshing the teacher's learning" (p.50). As I demonstrate in the previous section, in all three courses teachers do reach outside of academia to enrich the course program. Although I did not inquire during the interviews about the benefits of such activities for the instructors' own knowledge, I observed in CART 200 that the extracurricular activities Mark suggested to the group not only benefit students but also provide insight into new pedagogical activities and content.

This necessary ongoing training is one of the teaching challenges accentuated by the fast pace of change and the availability of information characteristic of teaching in networked times with continually evolving media. The depth of involvement of students with multiple media in their everyday life is changing the discourse inside the classrooms. Leão tells us that the teacher must acknowledge the learning process as a *triadic process* made up of communication, collaboration and constant evolution, and that in this *triadic process*, students are not "neutral receivers, but join their teachers as protagonists." (2008, p.293).

3.4) *Fostering technical proficiency in multiple media*

The collaborative learning process and the idea of students as protagonists (Leão, 2008) does not mean that the teacher loses his/her role as a mentor. It does mean however that the students are afforded greater responsibility in their contribution to the course by sharing their findings with the group and also in what comes to acquiring and exchanging technical skills. In all three courses students are responsible for finding the means to familiarize themselves with the media tools used in the production of their work. They can refer to tutorials and the department's facilities and technicians for troubleshooting but teachers encourage them to share their questions and expertise within the group. This makes for a more open-ended structure when it comes to training in technical skills and knowledge. I inquired about this model and the strategies that teachers adopt to deal with the different backgrounds and different levels of technical proficiency students arrive with.

Mark explained that, if some students need more step-by-step instruction, most students are comfortable with the problem-solving model adopted in CART 200 "where you come up with an idea and then you work on figuring out how to achieve it". To address the difficulty of accommodating different learning styles in the technical component, Marks assumes that all students come with no technical expertise and the assignments are not designed around specific technological processes, but rather around themes and concepts. In the first three assignments he specifies the medium and it is stipulated that the final work must be delivered in digital format. However for the work process students are encouraged to use the tools of their choice – including digital and analog devices. It should be stressed that the instructor does address technical issues

during studio classes in the labs and the department is equipped with labs assisted by technicians to help students in troubleshooting.

Similar to Mark's approach is Stephen Wilson's (2008) description of the Conceptual/Information Arts program (CIA) he has directed since 1987 in which students are expected to train in the digital applications and the different technical devices to develop their artwork, but they are not offered courses that strictly focus on learning to manipulate these tools. Students do so through courses that focus on abstract concepts "such as time, randomness and mapping" (p.38) so that, like in CART 200, it is the concepts that determine the approach to the media and how students use the technologies.

The CIA program goes further in requiring that students also take courses that touch on emerging research fields in which students are to experiment with media tools that are unconventional or still under development. This means that to address technical issues students often need to step off the beaten path of art and mainstream media. Wilson argues that such challenges foster the learner's development of processes of research (a form of meta skills), through which they will become more "enterprising and empowered in their approach to troubleshooting and innovation even when working with conventional applications and environments." (p.38)

I observed in Mark's class that this pedagogical model yields a great diversity of results and that students did not hesitate to experiment and combine different media. This model also allows students to become familiar with the tools with which their peers experiment. Because each student uses the tools of their choice and works the media in different ways, during group presentations students become familiar with multiple

approaches to using the technological devices. During presentations in CART 200, students often asked questions about the tools being used and how certain effects were being achieved. Mark mentioned in class that this approach makes for a very steep learning curve, especially for students who had no previous technological experience. I also observed in CART 400 final presentations that, by the final year of their program, students' work demonstrated a high level of technical proficiency.

3.5) *Course websites as an extension of the classroom*

In the context of this study, the computer is not only a creative medium; it is also an instructional tool. Computer technology and peripheral devices have become a reality in today's educational instruction (Halsey-Dutton, 2002). All teachers in my study made use of the resources from the WWW that, via the computer, go straight into the overhead projector onto the classroom screen. But I was particularly struck by the importance of the course websites as essential pedagogical tools that clearly function as extensions of the classroom.

The course outlines including the course objectives, the class schedule for the semester and the detailed assignments were available in the class websites of each course. The teachers had included a page for resources from which students could access most of the pedagogical support materials discussed in class. In the case of CART 210, Richard included several links to the Processing website and to general computer programming tutorials. Louise provided a helpful list of links to groups and collectives that research and debate technoscientific issues, so students could refer to them when investigating

their topics. In CART 200, the links to the artists' websites or works presented in class stayed available in the course website for students' future consultation.

The links on the resource section direct students to appropriate sources that were pre-screened by the instructor, thus giving examples of reliable sources suitable to the course and to the academic research context. This ensures a level of information quality control. When students rely strictly on common search engines to find information, they often come upon references of questionable authority. Being easily edited and functioning as a platform to access numerous other sources, the course websites also broadens the variety of examples brought into class. Furthermore, knowing that innovative digital art is being developed outside the institutionalized art system of galleries, museums, art magazines and fairs, this kind of artistic practice often comes to be known through artists' websites or through cyber "word of mouth" within networks of individuals sharing information on common interests. Students often navigate such networks to discover and bring new references to class, or add them to sections of the course website that students can edit themselves. Hence, the course websites also serve the pedagogical strategies discussed in 3.3 and 3.4 by emphasizing the idea of the student as a protagonist and contributor to the course content, and by serving as a platform for group exchange, for troubleshooting and developing technological methods.

Another important attribute of these websites are the students' pages. In CART 210, students posted their responses to the bi-weekly assignments in their individual pages so that the group could retrieve past presentations. The CART 400 course website also featured a group blog, which extended the class discussion beyond the classroom. Students as well as the instructor could post pertinent ideas and information that they

would come across and make it immediately available to the group. Finally, these websites are also a way to provide information that might be more useful to some students than others, thus saving class discussion time.

4) *Teaching responsibility and collaboration*

Finally, I have identified two interconnected teaching concerns underlying the pedagogic objectives and teaching strategies described above. These emerged from my discussions with Mark and Richard and can be identified within the CART 400 teaching objectives. The participants demonstrated a concern to foster in their students a sense of responsibility towards how they make use of the technologies and the impact of the content of their work, as well as an awareness of the collaboration that is characteristic of the contemporary paradigm in new media arts production.

Students entering the program have already been exposed to digital, interactive networked technologies, which they continue to manipulate in the course of their studies. Ten years ago, Tapscott (1998) was writing about a generation growing up routinely using networked games, web navigation, digital photography, film and video. That is the same generation that is now pursuing undergraduate university studies. So incoming students have already assimilated forms of representation and narrative structures characteristic of mainstream media that they sometimes feel compelled to replicate. It's always easier to relate to what is familiar, but in these courses, students are now asked to break out of these familiar frames, evaluate the potential of the technologies and become

active content creators, to draw inspiration from artists and authors and to become critics of their own reality.

In a presentation at the Digital Arts Weeks in Zurich Marcin Ramocki (2008) from the Department of Media Arts of New Jersey City University examines some of the most prominent strategies adopted by artists involved in the critique of technology and whose mission is to unveil "the aspects of technology that we take for granted". Ramocki asserts that, "It is that taking-for-granted which turns us into consumers of culture, as opposed to active participants. Figuring out what is inside the black box (and why it was made) is becoming the official duty of artistic communities." (p.31)

During my observations in CART 200 and CART 400 I have noted how teachers try to reverse the appealing influences of the mainstream media aesthetics and forms of narrative, and encourage students to imagine alternatives to these models. Mark, for example, begins his course with an introductory exercise in which students are asked to write and mail him information about their history and interests. Mark explained: "The fact that it is to be in written form and mailed, (...) is a whole reference to the old media, and I think a lot of students that are entering in the computation arts want to use all this high end software, all the greatest and latest, at the expense of what is so wonderful about traditional media." The assignments from CART 200 are designed to engage students with their immediate environment or with the space where they integrated their work. As Mark explained in his interview, asking students to creatively reinterpret their surroundings helps them to "break down the filters, that we put in our everyday life". In CART 400, Louise brought to class a wide range of issues through readings and class discussions with the objective of exercising critical thought over our technoscientific

mediated environment. In a different approach, CART 210 aims at developing alternatives to the mainstream tools and promote better control and understanding over the technologies artists choose to use. Students are introduced to the Processing programming language specifically conceived for artists and designers who wish to develop their own tools. Ultimately, students who continue to explore Processing will develop custom-made applications for their own creative projects and will no longer be bound to the dominant but limited application software packages available in the marketplace. In doing so, they will also be participating in the exchange that makes this programming environment grow.

Key to teaching and learning artistic practices that explore networked systems and interactivity is the idea of collectivity, which is another teaching challenge that emerged from the teaching objectives and strategies identified in this study. In the article *Unthinkable complexity: Art education in Networked Times* Robert Sweeny (2008) presents a number of challenges and possibilities for art educators who take advantage of the structure of the Internet. The Internet is the most prevalent contemporary model for networked interaction. It provides students with access to a variety of forms of information and promotes taking part in social exchanges. In this respect, collectivity also speaks about creation and distribution processes in the contemporary models of new media arts production. In order to better describe this phenomenon and discuss the pedagogical implications I have identified, I return to Thomas Rickert and Michael Salvo's (2006) article *The distributed Gesamptkunstwerk: Sound, worlding and new media culture* in which the authors "address the increasing dispersion of productive

processes across communities, technologies and spaces" (p.1) that is a result of the growing accessibility to computation tools and exchange of digital media. Crucial to these widespread forms of production are legal structures that were mentioned in the three course descriptions and were also source of pedagogical materials such as Creative Commons, Copyleft movements and open source applications. These sources allow for legal appropriation and reuse of media and ideas that feed a continued exchange of information. In CART 200, students explored these forms of exchange in assignments like *Shred* and through discussion of creative media works like the movie *Rip: a remix manifesto*. The movie raises critical issues of copyright and breaks the wall between users and producers by making the chapters of the movie available online and inviting viewers to use them in their own remix. This kind of practice, Rickert and Salvo (2006) explain, translate into the concept of "prosumer" – the term coined by Alvin Toffler (1980) which captures "the emergence of practices that join together the formerly separate categories of consumer and producer" (p.298). Although this model of production was a specific theme for Mark's CART 200 course, it was also used in CART 210 and 400. The use of downloaded data and open-source software (like Processing in CART 210), using peer-to-peer networking, accessing collective blogs, downloading readings and contributing to the sharing of information in the CART 400 course blog, all demonstrated that instructors understand that this type of collectivity is intrinsic to contemporary forms of art learning and making. Teachers foster students' participation in this collective exchange while conveying the important notion that the localized individual input has repercussion at a global level (Sweeny, 2008).

5) *The convergence of fields of study*

Many authors in *Educating Artists for the Future* (Alexenberg, 2008) argue that new media art education is, and is likely to remain in a state of constant change. The new media technologies some young artists are learning to explore offer unprecedented possibilities of connectivity, interactive flows of information and convergence of disciplines and communities, which evolve faster than educators can develop curricula that address all the meaningful questions surrounding these possibilities. Vinod Vidwans (2008) in *Expressing with Grey Cells* and Edward Shanken (2008) in *Entwined Histories: Reflections on Teaching Art, Science, and Technological Media* maintain that the convergence goes beyond the technologies and media: it takes place across fields of study, like the entwinement of art, science and technology in contemporary art making processes. It can be argued that art has historical connections with science, mathematics and other disciplines. However, authors in *Educating Artists for the Future* (Alexenberg, 2008) claim that the ubiquity of new media technologies in many realms of artistic expression is defining new orders of art practices and aesthetics that borrow research, thinking processes and even aesthetic characteristics from multiple disciplines. In other words, art is no longer an intuitive and sensible manifestation of the creative genius. The authors in this book voice their ideas and develop pedagogical models in response to these emergent creative paradigms.

The study I conducted provided some examples that testify to the convergence of media and disciplines in the curricula of the three courses and teaching strategies adopted by the instructors. The languages of programming explored in CART 210, for example, have been traditionally the domain of mathematicians and computer scientists. Now,

these art students are training in computation and calculus to develop the tools that better suit their artistic expression, given that the tools presently offered by corporate software developers for the digital arts are rather limited. Richard had an interesting perspective on artists mastering programming languages like Processing. In his point of view, this is no different from what is done by artists exploring other forms of artistic expression, like painters or sculptors "who are truly invested in the minutiae of the technique of their craft", except these digital artists and designers are investigating tools that were just recently introduced and are still being developed as creative tools.

CART 400 was designed to encourage students to see the research resources of multiple fields of study as artistic resources. The literature references suggested to students and discussed in class as well as the research topics that students investigated for their individual projects touched on a broad range of fields including biotech, social studies and information technologies.

I find it is important to end on this note about the convergence of multiple fields of study within new media arts, because this phenomenon is largely related to the properties of computation and the networked exchanges of information that keep reappearing throughout this study. The research I conducted shows evidence that pedagogical models for digital media arts are being developed and taught by taking into account how many other disciplines contribute to the present and future discourse of art. This section alone could be the subject for an entirely new research project. In addition, as it is argued by several authors in *Educating Artists for the Future,* such models are only transitory. I was told by one of my participants that the entire curricula of the Specialization in

Computation Arts Program is being re-evaluated and will probably undergo modifications to ensure it keeps up with the technological and conceptual changes occurring in the field.

CHAPTER 6

CONCLUSION AND FURTHER RESEARCH

The description and analysis of the three courses allowed me to articulate key ideas about developing and implementing curricula adapted to the theory and processes of new media art. These ideas pertain to the case studied, which is one model of pedagogy within a field that is growing very fast and in many different directions. In this chapter I summarize the answers that this case provided to the two primary research questions. I present the implications of the study for my own teaching practices and end with prospects for future studies, to build on what I have accomplished with this project.

WHAT are the conceptual frameworks, pedagogic objectives and teaching challenges of studio courses that explore contemporary approaches to creative technological practices?

This study demonstrated that the content of the studio courses that explore creative technological practices employing digital media are profoundly linked to the history of art and media theory. The structure of these courses builds on established models of art education, such as the theory-based model (Wilson, 2008). This model translates into a conceptual framework with explicit focus on the study of the historical and contemporary context of the media and artistic work. Teachers foster critical inquiry and analytical skills and train students to conduct individual research to guide the concept development of their projects and work processes.

However, this study also showed that within the theory-based model, practitioners are confronted with challenges that are specific to contemporary new media. The principal common challenges I identified in the three courses are the rapidly changing conditions and development of the media, the democratization of powerful digital technologies (including the computer) which students generally started exploring from a very early age (if only as passive consumers), and the proliferating information and media exchange available through networked platforms that are affecting the ways students conduct research and learn.

Consequently, when formulating the pedagogic objectives for these courses teachers aim at cultivating meta skills that will allow students to keep up with the pace of change, to navigate the complex networked world of accessible information. (Ascott, 2008, Wilson, 2008). Meta skills are essential to make sense of the overwhelming amount of information that students come across when they set out to interpret topics that emerge from multiple fields of study. Meta skills are individual ways of "learning how to learn" and investigate. They also entail the ability to collaborate with experts in other fields, which is an essential skill in today's interdisciplinary context of media production.

Nonetheless, students still need to develop the necessary skills to complete the projects assigned in class, like the hard skills of being proficient in multiple media, learning the history and theory of the field, and developing the terminology to articulate their ideas. They also need soft skills such as the ability to translate concepts into creative objects or experiences and develop their own work processes.

Another challenge lies in *HOW* exactly can one teach such pedagogic objectives? This takes me into the second research question.

HOW are instructors developing teaching strategies that incorporate the study of technology, artistic inquiry and critical thinking within today's context of rapidly evolving technology and theory?

A number of teaching strategies emerged from this study, making the point that teachers do not rely on a single method of instruction, but employ many kinds of strategies. The idea of a "triadic process" made up of communication, collaboration and constant evolution and the idea of students as contributors to the course content encompasses several of the teaching strategies discussed (Leão, 2008).

The practitioners' ongoing training is absolutely necessary in a field that continually evolves. However, the accessibility to the technology combined with the networked exchange of information and media mean that there are multiple sources of information and that each individual can only assemble her/his limited body of knowledge and expertise. Therefore the teaching strategies, including the pedagogical materials presented in class and the topics debated during group discussions, cannot impose a "canon for digital media" (Seaman, 2008). Rather, the courses remain permeable to the interests and knowledge that each student brings to the group, while the teacher takes on the role of mediator. This is where communication and collaboration come into play.

This study also demonstrated that such open structures foster not only the exchange of ideas and resources, but also of technical know-how when it comes to discovering the potential of the different media tools and how they can be combined. Encouraging collegiality and sharing technical expertise is an important strategy for students to use when choosing the media that best fits their practice, and also helps them to become fluent in multiple work methods with digital media. Students' contributions to the course

with their individual research and their technical expertise clearly contribute to the teacher's own learning and updating. Furthermore, the literature I reviewed demonstrated that collaboration and sharing of resources and information are essential skills for creating within the contemporary models of media production and distribution characterized by processes of exchange, recombinant media and the remix. Thus, it is imperative that these processes also be brought into pedagogical practice.

Finally, the instructors used strategies that aim at fostering a good understanding of present and past models of artistic practices in relation to the tools and media employed, and cultivate students' personalized processes of making art. The discussion and critique of pedagogical support materials encouraged students to be equally critical and self-aware of *how* they use the media tools and *why* they create specific objects and experiences. Students were also asked to articulate their work process during presentations to their peers, and share the findings of their research about concepts and issues they chose to address.

Teachers afford equal weight to strategies that encourage students to be aware of the kind of responses their ideas generate once they are materialized and presented to the group. Once the work exists by itself for an audience, regardless of the size of the audience (which in digital media can range from the classroom group to worldwide dissemination) the work is open to further discussion and criticism. Sometimes the work will instigate debates and further inquiry or, as was observed in CART 200, it will be appropriated, deconstructed and re-used in completely new experiences, thus becoming part of a new art making process.

New media art making relies on communication technologies, connectivity, and exchange of ideas and digital information. It is important for students to be aware of how their work is received and that they are accountable for the ideas they disseminate. The group discussion about pedagogical materials brought into class and about the work produced in class are essential teaching strategies for students to become as critical of what they put "out there" as of what they retrieve from "out there".

Implications for my personal teaching

This case study was designed to address my own concerns about developing curricula for technology-based and new media creative practices, and about teaching such curricula. As a result, it allowed me first-hand observation and dialogue with experienced teachers whose pedagogy focuses on media and topics related to my own artistic and teaching interests. By investigating the content and media tools explored in each course I was able to reassess my own technical skills and theoretical knowledge and resources, and to start thinking how all of it could be the basis of a course design that is meaningful to the training of other young artists. I identified pedagogic objectives and teaching strategies that I can incorporate into my future teaching, or that I will adapt to meet a specific course framework.

In addition to the implications of the study to my teaching practices, I rediscovered how important the role of students as collaborators is to the course content. It is something that I had not experienced or at least perceived as a student at the undergraduate level. Although I already understood the teaching/learning process as collaborative, I had not looked closely at the implications of this collaboration. I found

that communication and exchange are an essential part of the teachers' own learning and updating. This study confirmed my belief that in order to sustain meaningful artistic and teaching practices in this field, artists/teachers must remain aware of what is new in the new media arts, and provided me with examples of teaching strategies that are also learning opportunities for the instructor.

Further research

In the previous chapter I noted that technological and theoretical developments are still occurring and will continue to occur. Consequently, curricula (like the Specialization in Computation Arts program) in new media tools and theory are evolving to keep up with the developments in the field.

One of the directions I identified from this study is the convergence of contemporary art making processes not only with the most recent technological developments, but also with research studies and methods from the natural and social sciences. Although this idea provided insight into the second research question, to analyze it in depth would have extended the boundaries that I initially set for this investigation into other issues of teaching and learning new media arts. However, I intend to investigate this further in future studies.

In the continuation of my research in this field I am interested in investigating the development of curricula for studio-based art courses in which students investigate topics from multiple research fields through hands-on projects using technological tools. I am particularly interested in studying the possibility to adapt the pedagogic objectives and teaching strategies that are presently employed at the undergraduate university level to

the education of a younger population. As was mentioned in this study, students manipulate digital technological tools from a very early age now (Tapscott, 1998), so such a studio course would allow students to effectively learn how to use the tools they already know and to produce meaningful content. The outcomes of this research process increased my interest in developing curricula that fosters in teenagers and young adults a greater responsibility for the media they are already producing and publishing/broadcasting, while developing the aesthetic, creative and critical skills that are characteristic of artistic endeavors. These are skills that they can apply later on, in whatever field of studies or career goals they choose to pursue.

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APPENDICES

APPENDIX I: CART 200 – Class Schedule

WEEK ONE – January 7

Topics: Acoustic Ecology and Aural Literacy

Exercise Introduction: *Handle With Care*

Assignment 1a) *The Tuning of the World* introduction

WEEK TWO – January 14

Topics: A Sound Education

Exercise *Handle with Care* due (to be post-marked by this date)

WEEK THREE – January 21

Topics: Recombinant Practices

Assignment 1a) *The Tuning of the World: Collection* due (field recordings)

WEEK FOUR – January 28

Topics: Editing the Built Environment

Assignment 1b) *The Tuning of the World: Deconstruction* due (text cut-up)

WEEK FIVE – February 4

Field Trip to *Replay* – Christian Marclay (DHC/ART)

WEEK SIX – February 11

Topics: Science and Sound : Synaesthesia

Assignment 1c) *The Tuning of the World: Reconstitution* due (site-specific audio)

Assignment 2 *You are here* introduction

WEEK SEVEN – February 18

Topics: Temporal Subjectivity

Topics: perception, memory, time-shifting, compression/expansion and relocation of space

WEEK EIGHT – February 25

Mid-term break

WEEK NINE – March 4

Topics: Narrative and Personal Documentary

Assignment 2 *You are here* due

Assignment 3 *Dialogues* introduction

WEEK TEN – March 11

Topics: Interplay and Intertextuality

WEEK ELEVEN – March 25

Topics: Emergent and Interactive Media

Assignment 3 *Dialogues* due

Assignment 4 *Shred*, introduction

WEEK TWELVE – April 1

Topics: Real-time performance and Responsive Systems

WEEK THIRTEEN – April 8

Presentations

Assignment 4 *Shred* due

APPENDIX II: CART 210 – Class Schedule

WEEK ONE – January 6

Topics: Introduction to programming

WEEK TWO – January 13

Topics: Processing IDE, Variables, Functions, Debugging

Reading due: Luciano Floridi *Philosophy and Computing*, Chapter 2 pp. 20-25, 47-50

WEEK THREE – January 20

Topics: Functions, Variable scope

Assignment 1: *Variables* due.

WEEK FOUR – January 27

Topics: Control structures, Functions, Generative art

Reading due: Geoff Cox "Aesthetics of Generative Code"

WEEK FIVE – February 3

Topics: Application design, Interaction, Bitwise operations

Assignment 2: *Functions* due.

WEEK SIX – February 10

Topics: Animation, Color

WEEK SEVEN – February 17

Topics: Arrays

Guest lecturer Daniel Shiffman

Assignment 3: *Interaction & Animation* due.

WEEK EIGHT – March 3

Topics: Text

WEEK NINE – March 10

Topics: Intro to Object-oriented programming I

Assignment 4: *Interaction & Animation II* due.

Reading due: Lars Hallnäs, Johan Redström, Interaction Design, pp.106-113

WEEK TEN – March 17

Topics: Intro to Object-oriented programming II

WEEK ELEVEN – March 24

Topics: Intro to Object-oriented programming III

Proposal for Assignment 6: *Final project* due

WEEK TWELVE – March 31

Topics: External libraries

Assignment 5: *Basic OOP* due

WEEK THIRTEEN – April 7

Final project studio

WEEK FOURTEEN – April 14

Presentations

Assignment 6: *Final Project* due.

APPENDIX III: CART 400 – Class Schedule

WEEK ONE – January 5

Lecture: Issues based Art & Design

Readings: *Uglies* Part 1 (pp. 3-135) (Westerfeld, 2005)

WEEK TWO – January 12

Lecture: Reproductive Technologies

Seminar: Discussion of *Uglies* (Westerfeld, 2005) and recommended readings

Studio: Understanding graphic narratives

Readings: *Uglies* Part 2 (pp. 139-284)

(http://www.situatedtechnologies.net/files/UrbanComputing.pdf)

WEEK THREE – January 19

Lecture: RFID and the Internet of Things

Seminar: Discussion of *Uglies* (Westerfeld, 2005) and recommended readings

Studio: Developing a futuristic story concept

Readings: *Uglies* Part 3 (pp. 287-425)

WEEK FOUR – January 26

Lecture: Genetically modified organisms

Seminar: Discussion of *Uglies* (Westerfeld, 2005) and recommended readings

Studio: Storyboarding a graphical narrative

WEEK FIVE – February 2

Studio: Working on individual graphic narratives.

WEEK SIX – February 9

Project 1 due – Presentations and critique

Readings: *The Future of Science is... Art?* By Jonah Lehrer (http://www.seedmagazine.com/news/2008/01/the_future_of_scienceis_art.php) and *The artist and the physicist meet up to discuss science as a public enterprise* by Jeremijenko + Lawrence Kraus (http://www.seedmagazine.com/news/2007/12/natalie_jeremijenko_lawrence_k.php)

WEEK SEVEN – February 16

Lecture: Future collectives of humans and non-humans

Seminar: Discussion of *The Future of Science is... Art?* And and *The artist and the physicist meet up to discuss science as a public enterprise*

Studio: Project 2 – Preliminary research and concept development

Readings: Students must select one research article on a technoscientific issue of their interest.

WEEK EIGHT to WEEK ELEVEN – March 9, 16, 23 and 30

Studio: Work on Project 2

WEEK TWELVE – April 6

Project 2 due – Presentations and critique